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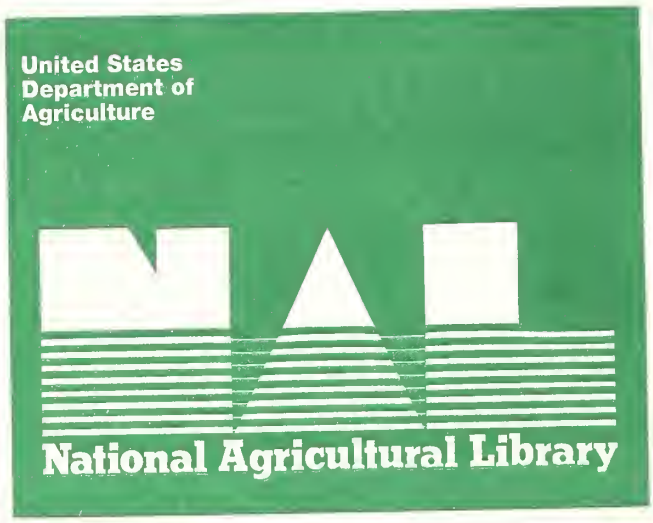
Final Environmental Impact Statement for Canadian River Tamarisk Control

Cibola National Forest
Harding and Mora Counties
New Mexico



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Final Environmental Impact Statement for Canadian River Tamarisk Control

Cibola National Forest
Harding and Mora Counties, New Mexico

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Abstract: The Cibola National Forest proposes to control the nonnative invasive species tamarisk (also known as salt cedar) along the Canadian River on the Kiowa National Grassland. The EIS discusses two alternatives in detail, the no action alternative (Alternative 1) and the proposed action (Alternative 2). The proposed action provides for a combination of aerial herbicide spray and hand application of herbicide. The Forest Service considered other alternatives that do not require the use of herbicides and determined that they would not meet the project's objectives or they were not feasible. The proposed action is the preferred alternative.

Summary

Background and Purpose and Need

Tamarisk, or salt cedar, of the genus *Tamarix* is a small tree or shrub introduced to North America from southern Europe or the eastern Mediterranean region in the 1800s as an ornamental. It was later planted extensively to control streambank erosion. The species escaped cultivation and is now widespread on flood plains throughout the western United States. Riparian areas, seasonal wetlands, and lake margins are most susceptible to invasion by tamarisk, although the species is widespread in areas away from river and lake systems. Tamarisk produces many small seeds, often transported by water and wind making spread of the plant rapid, especially along streams. Once established, its seedlings grow faster than most native plants. The species can quickly dominate an area, out-competing native plants for sunlight, moisture, and nutrients.

Both the State of New Mexico Department of Agriculture and the Federal government list the tamarisk as a noxious weed. The "New Mexico Non-Native Phreatophyte Management Plan" (NMDA, 2005, page 10) describes tamarisk's adverse effects on native vegetation, riparian habitat, soil salinity, wildfire frequency and intensity, and stream morphology and hydrology. Although research can apply no specific value to the plant's water consumption, general estimates are that salt cedar dominated communities use 25 percent more water than cottonwood/willow plant communities. Anecdotal evidence exists of water availability increasing after salt cedar removal on two sites in New Mexico. Research continues into quantifying the effects of salt cedar removal on water availability.

The Canadian River originates in the east slope of the Sangre de Cristo Mountains, of extreme southern Colorado, northwest of Raton, New Mexico. The river runs south and southeast from its origin and exits the state east of Ute Lake and Logan, New Mexico. The Canadian and its tributaries is the major watercourse in northeast New Mexico and the primary water source for Conchas and Ute Lakes. It is the major water supply for several irrigation systems and acequias, as well as various communities. The water of the Canadian River supplies thousands of acres of agriculture, recreation opportunities, livestock water, wildlife habitat, and is home to several indigenous wildlife species. An inventory of Canadian River system drainages estimates that tamarisk has invaded about 8,560 acres along the main stem and about 23,175 acres along its tributaries. The New Mexico Soil and Water Conservation Districts throughout the Canadian River watershed, in concert with State agencies such as the New Mexico Department of Agriculture, organized and developed the Canadian River Riparian Restoration Project (CRRRP) to address control of invasive species like tamarisk. The priorities of the CRRRP are tamarisk control, riparian species revegetation/restoration, long-term management, maintenance, and monitoring of the Canadian River. This group is working with private landowners, agencies such as the USDA Forest Service, local governments, and non-profit organizations across jurisdictional boundaries along the 290 miles of the Canadian River in New Mexico. The CRRRP developed the plan to control tamarisk starting at the headwaters of the drainage and moving downstream. One of the goals of the plan is to treat tamarisk infestations sequentially from upstream to downstream to reduce the potential for re-invasion from upstream seed sources.

Over the last few years, the CRRRP treated about 3,820 acres of salt cedar on private and State lands along the Canadian River upstream from the Kiowa National Grasslands. To effectively control the species and reduce the potential for re-invasion, the Forest Service needs to address tamarisk infestations on Federal land along the river. The Forest Service needs to control the species on the portion of the river that traverses the Kiowa National Grassland, otherwise downstream control treatments on other ownerships would be ineffective due to the biological

characteristics of tamarisk. The species produces large amounts of seed that the river can transport downstream, which would germinate and re-invade previously treated areas before native vegetation could occupy the sites.

Proposed Action, Public Involvement, and Issues

The Cibola National Forest proposes to apply the herbicide imazapyr to control tamarisk on about 540 acres on the Kiowa National Grassland administered by the Forest Service. The areas to be treated are scattered along approximately 16 miles of the Canadian River (including tributaries and side drainages where tamarisk occurs), from just north of Biscante Canyon to just south of Whitman Canyon. The area affected by the proposal includes the riparian areas that lie along the Canadian River and its side drainages. This stretch of the Canadian River lies within Mills Canyon, an area known for its steep canyon walls, narrow corridor, and limited access.

The Federal Register published the Notice of Intent (NOI) to prepare an environmental impact statement on May 13, 2005. The NOI provided for public scoping comment on the proposal through June 15, 2005. As part of the public involvement process, the Agency, on May 6, 2005, sent a letter describing the proposal and soliciting comments to interested and affected individuals and organizations. This scoping letter provided for comments until June 15, 2005. The forest also published a public notice in the May 25, 2005, edition of the "Union County Leader" newspaper notifying the local community of the project and the opportunity to provide scoping comments. On July 11, 2005, the Forest Service held a meeting in Roy, New Mexico, to brief the public on the project's progress and provide another opportunity to comment.

The Forest Service received several comments in response to the public involvement efforts. The interdisciplinary team (ID team) and responsible official reviewed the responses to determine the issues associated with the proposal. The responsible official determined that none of the comments received were significant, which does not mean that the issue does not merit analysis, only that an alternative does not need to be developed to address it. Several responses stated opposition to using any herbicide (including imazapyr) and identified the potential for unintended effects on people and the environment from the use of herbicides as a concern. Although the comments about herbicides did not merit inclusion as a significant issue, the ID team and responsible official considered alternatives to herbicides.

Alternatives

The issues led the Agency to develop alternatives to the proposed action including:

No Action

Under the no action alternative, current management plans would continue to guide management of the project area. No tamarisk control would be implemented to accomplish project goals.

Proposed Action

Aerial spray by helicopter would be used when tamarisk is too dense to be effectively controlled by backpack application or when the treatment area is inaccessible by vehicle (estimated 380 acres). Backpack spray (hand treatment) would be used after tamarisk has been cut with either chain saws or tractor, and the herbicide is applied to the cut stump, or the herbicide is applied over the top of stems as a foliar application (estimated 160 acres). Areas treated by backpack application would depend on location, access, and amount of native vegetation that needs

protection. Treatments would be applied between late July and late September, and includes re-treatment of sprouting tamarisk for up to 5 years following initial treatment, as needed to control new growth.

In addition, the Forest Service considered several other alternatives that did not include the use of herbicides. These alternatives were:

Using mechanical equipment to remove tamarisk. This alternative, proposed by the public during scoping, would use a backhoe type of machine that could pull the tamarisk, including roots, from the ground. No herbicides would be used and sprouts would be treated by hand pulling each year. The interdisciplinary team considered this alternative but eliminated it from detailed study because of the lack of road access into much of the river flood plain. Of the 16 miles that need treatment, only about 4 miles have roads that provide access to tamarisk stands. In addition, in the areas with access, such as around Mills Canyon Campground, the mature tamarisk stands have accumulated silt, sediment, and debris from high water flows within the Canadian River. These debris berms provide bank and soil stabilization during flooding. Pulling the tamarisk out by the roots would cause damage to the berms and their subsequent failure; leaving banks and flood plains susceptible to soil erosion during high flows.

Using livestock, such as goats, to control tamarisk. This type of treatment works well in areas where there is a wide flood plain and access for the herders. Goats are effective if the trees are small enough for the animals to reach and if the treatment is applied several years in a row. The interdisciplinary team discussed this alternative but recommended to eliminate it from detailed study because of poor access and the potential effects to the river cut banks from hoof shearing.

The use of fire to control tamarisk. Fire can be an effective tool for reducing fuel load accumulations within tamarisk stands. However, fire alone is ineffective at controlling tamarisk because it only kills the above ground portion of the plant, leaving the below ground root structure to re-sprout. Tamarisk is a fire-adapted species that sprouts vigorously after burning. Fire has also been known to stimulate flowering and seed production as a survival response. Even though fire can reduce tree growth and keep stands from reaching maturity, eradication or sufficient control with fire alone is unlikely to occur.

Biological control of tamarisk. Several western states have used a non-indigenous leaf beetle, *Diorhabda elongata*, as a control treatment for tamarisk. The salt cedar leaf beetle originates in central Asia, where it defoliates large areas of tamarisk. The USDA's Animal and Plant Health Inspection Service (APHIS) has not approved its general release in New Mexico. APHIS recently approved the release of the leaf beetle in New Mexico on an experimental basis, but the release does not include the Mills Canyon area.

Decision to be Made

Based on the project's purpose and need and the environmental consequences, the responsible official will decide whether:

- to implement tamarisk control treatments as described in the proposed action, or
- to vary the design of the proposed action to meet the purpose and need through some other combination of activities, or
- to take no action at this time.

Environmental Consequences

Chapter 3 of the DEIS presents the affected environment and the analysis of potential impacts. The following is a summary of the potential impacts, by resource area, predicted to result from implementation of either the proposed action or no action.

Vegetation

Under no action, tamarisk infestations would expand. The amount of tamarisk would increase through two modes: (1) expansion of existing infestations, and (2) creation of new infestations. Over time, tamarisk would expand to the extent of suitable habitat. Because the species produces large amounts of highly mobile, viable seeds throughout the growing season, new infestations would likely develop in the remaining unoccupied riparian zones throughout the canyon. Over time, tamarisk would dominate all riparian zones in the canyon. There would be a reduced amount of native riparian vegetation. Without treatment of infestations in Mills Canyon, the downstream control actions would be ineffective. Infestations in Mills Canyon would produce seed that the river transports to these downstream locations. This would provide a constant source of new tamarisk seedlings.

Under the proposed action there would be a reduction in the amount of tamarisk along the Canadian River on the Kiowa National Grassland (NG). Based on results achieved in other similar control operations, herbicide treatment would result in 85-95 percent effectiveness. At this effectiveness rate, only scattered tamarisk would remain after the initial treatment. Followup treatments to control these individuals would be done. Some native willow and cottonwood plants would be killed where they grow in close proximity and in intermixed stands with salt cedar. Dead tamarisk would be left undisturbed for 2 years after treatment to prevent stimulation of root sprouting. Grasses and herbaceous species that exist along the margins of infestations would re-colonize the areas first. As floods disturb the riparian zones, willows and cottonwoods would be established from nearby seed sources. Because most infestations are restricted to a relatively narrow band along the river, this recolonization would be relatively rapid. In wider areas or those that do not adequately revegetate naturally, cottonwoods, willows, and other appropriate riparian species would be planted. Future planned treatments downstream from Mills Canyon on other ownerships would be more effective in controlling tamarisk. There would be far fewer seeds produced from Mills Canyon infestations, reducing the probability of re-infestation of downstream treated areas.

Soil and Water

Under no action, site degradation would continue to occur from excessive water use by tamarisk and from salts deposited on the ground through the leaf litter. Native plants that contribute to

bank stability, particularly grasses, rushes, and sedges, would have difficulty germinating because of the increase in salts, which would lead to an increase in bank and riparian erosion and sedimentation. Alkalinity in the surface soil and water quality may be adversely affected—runoff and seepage through the soil into the stream channel can carry the salts into the water increasing its salinity. Increased sediment delivery to drainages would affect the hydrologic functioning of streams. These changes can lead to adverse effects, including altering the carrying capacity of the streams, narrowing and down cutting of the channel, and increased flooding and diverting of waterways from their natural flow paths.

Under the proposed action, native vegetation, including cottonwoods, willows, rushes, and sedges would be re-established where tamarisk is removed. As this occurs, the potential for adverse effects on hydrologic conditions would decrease because hydrologic processes would return to more normal conditions. This would reduce the likelihood of increased erosion, surface runoff, and sediment delivery. Channel stability and runoff conditions would be improved compared to existing conditions. Control actions would greatly reduce or eliminate water use by tamarisk, which would improve watershed condition. Tamarisk removal would make more ground water available for native plants, which generally use less water than tamarisk. It may also increase flow in the channel for downstream use, although research on increased waterflow due to tamarisk reduction is incomplete or inconclusive. This alternative provides for use of the herbicide imazapyr, which could enter the soil or water. Although imazapyr that lands on the soil may enter water through leaching, surface soil runoff, or flooding, it would not present an appreciable risk to water quality because the chemical rapidly decomposes in water. Depending on rainfall frequency, imazapyr will remain available for uptake by plants for about 3 months unless storm events and subsequent percolation move the chemical into the stream where it will photodegrade in about 2 days.

Wildlife

The Canadian River drainage contains a diversity of vegetation, climate and geology, which in turn provides habitat for a variety of wildlife and fish species. Based on information provided by the U.S. Fish and Wildlife Serviee, six threatened or endangered (T&E) animal species may exist in Mora and Harding Counties. There are no T&E plants and there are no proposed species for Federal listing within the project area. Only the bald eagle and Arkansas River shiner are known to have habitat in or near areas where project activities would take place. Although not detected during surveys in the area, habitat exists for the sensitive yellow-billed cuckoo and the Canadian speckled ehub.

Under no action, the primary concern for wildlife would be the continued alteration of native habitats. There would be no direct effects on wildlife. Indirectly, the increase in salt cedar would affect riparian habitats and aquatic habitats. The expected changes in stream hydrology have the potential to create an increase in ephemeral stretches of river that would not be available to the Arkansas River shiner, Canadian speckled chub, or other native fish and aquatic organisms.

Habitat changes would affect native bird species. The increased loss of natural cottonwood galleries and willow riparian stand components in all age classes will continue with expansion of salt cedar in the proposed project area. Salt cedar does not allow the natural regeneration of native vegetation to occur by directly out competing seedlings and by increasing salinity contents in soil through shed leaves. Since yellow-billed cuckoos nesting in riparian areas prefer cottonwood galleries with an established willow understory to nest, the increase and continued invasion and

creation of a monoculture of salt cedar throughout the Canadian River drainage would be an indirect effect of loss of cuckoo habitat over time. Research has shown that bird diversity in salt cedar is much less than in native cottonwood stands with a well developed willow understory. There is no understory vegetation in a monoculture of salt cedar, which is reflected in the lack of berry and seed producing shrubs and plants, or insect diversity extremely important to nesting and migrating birds.

The proposed action and its associated activities are not expected to affect the bald eagle or its foraging or winter habitat quality, since implementation would occur in late summer (mechanical) and fall (aerial application in August and September) when eagles are not present. Salt cedar treatment under the proposed action would not target any of the large ponderosa pines and cottonwood galleries that could provide potential roost and perch sites. In addition, a treatment of tamarisk would occur during a short window in the fall and would not affect any potential wintering bald eagles.

There would be no direct effects associated with the proposed action alternative to the Arkansas River shiner, Canadian speckled chub, other aquatic species or their habitat. The herbicide imazapyr is classified as practically nontoxic. An ecological risk assessment completed for the Forest Service summarized the herbicide's toxicity to fish species and described typical scenarios for imazapyr to enter water through overspray or runoff. At the planned application rate, the analysis showed that there would be "no plausible basis for asserting adverse effects to nontarget aquatic species."

There would be no direct effects to yellow-billed cuckoo from implementation of the proposed action since no cuckoos were detected during breeding bird surveys conducted from 1993-2002 (Schwarz, 2005). Indirect effects to cuckoo habitat may include temporary loss of cover habitat, and reduction in insect abundance until new vegetation becomes established in the understory, since aerial spraying will remove salt cedar foliage and only the skeletons will remain. These temporary losses will be offset in the future as native cottonwood galleries and willow stands become established since salt cedar does not support the same species richness, guilds, and population sizes as do native stands of cottonwood/willow.

The proposed action would not directly affect terrestrial species. The timing of activities would protect nesting birds. Many bird species migrate through the Canadian River riparian corridor during the fall on their annual trek south. The seasonal restrictions placed on aerial spraying to prevent disturbance to the golden eagle would also benefit nesting neotropical migrants. Aerial spraying would occur during the months of August and September. Adults, fledged, and early migrant neotropical bird species most likely to be directly impacted by aerial spraying both are the ones. However, according to the risk assessment, there would be no adverse effects. The assessment considered direct ingestion of imazapyr as well as consuming contaminated insects. Based on the imazapyr application rate, small birds consuming contaminated insects may receive a dose of 3.76 mg/kg/event. This exposure is below the toxicity value of 674 mg/kg/event (the No Observable Effects Level (NOEL)). After aerial application, indirect effects may include displacement of nest sites, temporary loss of habitat, and reduction in insect abundance until new vegetation becomes established in the understory. The aerial spraying will remove salt cedar foliage and only the salt cedar skeleton will remain. Birds previously using salt cedar for nesting may be displaced and forced to nest in other areas until native vegetation recovers the sites. This may result in increased competition in the remaining cottonwood or willow galleries. Neotropical

bird species will forage within the salt cedar, even though there is a lower diversity of insects found in salt cedar compared to native vegetation.

Waterfowl (e.g. mallards or early migrating teal) may consume sprayed aquatic vegetation. Based on the imazapyr application rate, waterfowl consuming contaminated aquatic vegetation may receive a dose of 2.69 mg/kg/event, which is below the NOEL of 674 mg/kg/event. Therefore, there would be no adverse effects.

Recreation and Scenic Resources

There would be limited direct effects on recreation from the no action alternative. Tamarisk would continue to be a dominant species in the riparian area. Where the tamarisk thickets dominate, they would reduce recreation access to the river. Increases in the amount and density of tamarisk would further reduce river access over time. Tamarisk will continue to be a visual element along the riparian area of the Canadian River. Viewers who are not aware that the species is invasive may see the plant as enhancing the scenic quality. If a viewer is aware that they are not native to this region and concerned about the impacts to native species, tamarisk may be seen as detrimental and not enhancing the scenic quality.

The initial effect of the proposed action would be the closure of Mills Canyon during tamarisk spray activities. The Forest Service would close the canyon to recreation during aerial spraying operations and one day following treatments. The presence of dead tamarisk stems is not expected to change recreation use. As the tamarisk component decreases through cutting or natural decomposition, access to the river would improve. Over a 5- to 10-year period, willows and cottonwoods would re-establish in areas previously occupied by the tamarisk. This may enhance bird-watching opportunities and create the shade that improves fish habitat. There would be a short-term loss of scenic quality for the first 2 years, while dead tamarisk stems are visible. The herbicide imazapyr does kill other species of plants, and there may be some collateral loss as well. While tamarisk contributes to the scenic quality, the river, canyon walls and entire riparian vegetation community are the primary features of the scenic resources. This short-term loss of quality would meet the Visual Quality Objective of Partial Retention, where management activities remain visually subordinate to the characteristic landscape. The visual influence of dead tamarisk would be subordinate to the dominant landscape.

Heritage Resources

Under no action, heritage resources would remain in their similar state and there would be no adverse effeet. Frequent flooding through this canyon has created a setting that is not conducive to the preservation of heritage resources. Even if tamarisk were to remain in this area, it would not be likely to eause significant direct or indirect effects. If tamarisk continues to expand to areas where heritage resources are located, effects to the resources may occur. These effects may include minor changes in surface erosional patterns or bioturbation (root disturbance) which could result in loss or misinterpretation of information. The trend of expansion of tamarisk could have an impact on historically procured plant materials that the Jicarilla Apache identified by continuing to invade and replace native plant species.

Under the proposed action, mechanical treatment would have the potential to affect heritage resources. The types of direct effects that could occur include displacement or compaction of artifacts and damage to surface features and structures that would result in a loss of integrity. There would be no adverse effect because ground-disturbing project activities would be confined

to the river channel or within the gaps between the features of the recorded site. Given the nature of the environment, it is unlikely that heritage resources remain within the flood plain, and that the portions of the known site that are within the treatment areas contain no features or artifacts, these potential effects would not be adverse. Aerial spraying and hand treatment would have no direct or indirect effects to most heritage resources as there would be no ground disturbance and this is a highly disturbed environment with little to no potential for archeological sites. There is some potential to affect plants that American Indians utilize. However, currently no tribes gather plants in the Canadian River area.

Human Health and Safety

Any noxious weed treatment may pose potential risk to human health and safety in two types of exposures, *general exposure* and *accidental/incidental exposure*. General exposure refers to human exposure resulting from the normal use of the chemical. Accidental/incidental exposure scenarios describe specific examples of gross overexposure associated with mischance or mishandling of a chemical. The two basic groups associated with herbicide exposure include workers and the general public.

Workers who are involved in herbicide application face accidental exposure in a couple of different ways. Because part of the proposed treatment involves aerial application, the greatest threat of accidental exposure to workers would be through the mixing process. Workers who perform ground application using a pump-up backpack sprayer could face possible exposure through leakage of the backpack. In addition to the workers doing the various treatments, there may be exposures to people living, working or recreating in the treatment area that are exceptionally sensitive to any chemical exposure in the environment.

If there was no application of herbicide or mechanical treatments, there would be no potential for exposure to either workers or the general public. Therefore, there would be no direct or indirect effect to health and safety as a result of the no action alternative.

The EPA has approved the herbicide proposed for treatment of this plant under the proposed action. The toxicity of imazapyr has been relatively well characterized in experimental mammals. The Forest Service completed a human health and ecological risk assessment for imazapyr that incorporated the most up-to-date scientific information available.

Under the proposed action, potential health risks to workers may include injuries from the manual and mechanical actions taken to control salt cedar. These are relatively minor and include cuts, burns, abrasions, fractures, skin irritation and allergic reaction during the use of chain saws and or shears. There is also the possibility of accidental fuel spills using this equipment. Apart from these hazards, workers could also face potential risks from direct herbicide exposure, either during the mixing process, application process or monitoring process. Imazapyr can be mildly irritating to eyes and skin. This is the most likely effect to occur if care in use is not observed or personal protection equipment (PPE) practices are not employed. Exposures to imazapyr do not lead to estimated doses that exceed a level for concern for either workers or members of the general public at the application rate. This indicates the herbicide use would not affect worker and public health and safety. Use of imazapyr to control salt cedar is not without risk. All chemical exposure results in some level of health risk, the risk primarily being a function of the dose, or amount a person is exposed to over time. However, the same literature that raises concern over health effects also clearly reports that effects occur at doses significantly higher than that expected through use in this project. The estimated dose of imazapyr that a worker or person of

the general public may be exposed to through this project would be below that determined to be safe by the U.S. EPA for a lifetime of daily exposure. Therefore, no health effects and risks to workers and the general public are anticipated from imazapyr use in this project.

Social and Economic Factors

With the no action alternative, tamarisk would continue to invade the riparian areas of the Canadian River and prevent the growth of native species. Because tamarisk consumes more water than native species, water availability for human uses would decrease as tamarisk spreads across the landscape. Water availability for irrigation and cattle is an essential resource for maintaining the agricultural industries in Mora and Harding Counties. For Harding County, this industry supports nearly half of all employment. In the long term, a reduction in water availability would negatively impact the economic sustainability of farming and ranching.

The proposed action would generate some employment to conduct aerial application and hand treatments, and to monitor the overall effort. Most of the employment will not have significant short-term impacts on the local economy. The hand treatments might generate some local employment, if a local organization submits a successful bid for the contract. Overall, the direct economic impacts of the Forest Service activity would be minimal and short term.

In the long term, the local economy would receive the greatest benefit from avoiding negative economic impacts to the agricultural industry. The treatments would increase water yield once completed. This will provide a more reliable source of water for human activities and stabilize the agricultural economic base of the counties.

During aerial treatment, the Forest Service will suspend recreation use in the canyon. This would have an impact on local recreation users because no comparable recreation area exists in the vicinity. The canyon provides opportunities for shade, wildlife viewing, hiking, camping, fishing and hunting. Suspending recreation use would keep users out of the canyon about 1 week and would shift minimal use to other recreation sites within the region.

Aerial treatments would generate noise pollution and traffic, another social effect that would result from this alternative. Since the Forest Service would close the canyon to recreational users during this time, there would be minimal impact from noise pollution (disturbance) to people. Adjacent landowners may experience some noise increase. Traffic on Forest Road 600 would increase in the short term with the application of hand treatments to the site. They would have minimal effect on adjacent landowners in terms of increased travel time, surface conditions and increased dust.

Wildlife related recreation activities such as wildlife viewing and hunting would experience short-term effects from the project. The loss of tamarisk along the river would provide less shade and cover when elk, deer and other game are in the area. In a few years, cottonwoods and willows would replace the tamarisk, which would allow for cover comparable to pre-treatment conditions. Hunters in the canyon may experience increased success rates for some time while the native species become re-established. The decreased cover would make viewing of larger wildlife easier, while for birds there may be some decrease in populations. Nevertheless, some birds will nest and forage in the area soon after treatments are finished. While there will be less diverse bird populations for bird watchers in the short term, the diversity and populations will increase once native species are present.

Environmental Justice

Harding and Mora Counties have populations of minority and low-income persons; however, the conditions and mitigations of the aerial herbicide treatments would not disproportionately expose these groups to substantial health risks. The risk assessment and human health effect analysis show that the public will have limited routes of exposure to herbicidal residue. Besides direct contact, residue found in water or game and cattle is a possible source of exposure. Even with these routes being present, there is no evidence that chronic exposure would occur and mitigation measures would prevent acute exposure. Because natural features (the location of the tamarisk) determined the site of this project, no alternative site can be selected to change the economic or social makeup of the affected population. The minority and low-income populations of the counties will be just as likely as other groups to experience environmental effects from this project.

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this final environmental impact statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This final environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose of and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the Agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the Agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement such as the record index, public comments and responses, etc.
- *Index:* The index provides page numbers by document topic.

Additional doeumentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Cibola National Forest Supervisor's Office in Albuquerque, New Mexico. In response to the comments received on the DEIS, minor additions have been made to the body of the document. These are: clarification that the proposed action provides for planting of locally collected plant material for restoration (chapter 2), additional disclosure of roadless and wild and scenic river designations in Mills Canyon and the Canadian River, and discussion of project costs (chapter 3). Appendix C, which addresses all comments received during the DEIS comment period and the responses to each, has also been added.

Background

Tamarisk, or salt cedar, of the genus *Tamarix* is a small tree or shrub introduced to North America from southern Europe or the eastern Mediterranean region in the 1800s as an ornamental. In the early 20th century government agencies and local landowners planted tamarisk to control streambank erosion. Tamarisk is a "facultative phreatophyte," a plant that grows best when there is an attainable source of ground water, but which can survive without a damp substrate. The species escaped cultivation and is now widespread on flood plains throughout the western United States. Riparian areas, seasonal wetlands, and lake margins are most susceptible to invasion by tamarisk, although the species is widespread in areas away from river and lake systems. Tamarisk

produces many small seeds, often transported by water and wind making spread of the plant rapid, especially along streams. Once established, its seedlings grow faster than most native plants. The species can quickly dominate an area, out-competing native plants for sunlight, moisture, and nutrients. Mature plants can withstand prolonged drought or periods of inundation. The plant also brings salts to the surface by excreting it through the leaves and dropping it onto the soil surface below the canopy (DiTomaso, 1996).

These characteristics of tamarisk cause a number of changes to the biological and physical resources of the areas in which it grows. In general, the following adverse impacts are widely recognized (NMDA, 2005):

- Tamarisk populations develop into dense thickets that can prevent establishment of native vegetation such as cottonwoods, willows, grasses, and forbs.
- As a phreatophyte, tamarisk invades riparian areas, potentially leading to extensive degradation of habitat and water quality, and loss of biodiversity in the stream corridor.
- Salts drawn from the ground water by tamarisk and deposited on the ground and water surface with the leaf litter increases surface soil and water salinity to levels that can prevent the germination of many native plants and negatively impact water quality.
- Tamarisk seeds and leaves are of little value to most wildlife and livestock as a food source.
- Leaf litter and dead and senesced woody material from tamarisk tends to increase the frequency and intensity of wildfires that kill native cottonwood and willows but not tamarisk. The Rio Grande bosque has experienced numerous wildfires over the past several years due to this situation.
- Dense stands on streambanks may gradually cause narrowing of the channel and an increase in flooding. Channel narrowing along with tamarisk-induced stabilization of streambanks, bars, and islands leads to changes in stream morphology that can impact habitat for aquatic species.
- Dense stands affect livestock by reducing forage and blocking access to surface water.
- Aesthetic values of the stream corridor are degraded, and access to streams for recreation (e.g., boating, fishing, hunting, bird watching) is lost.

Both the State of New Mexico Department of Agriculture and the Federal government list the tamarisk as a noxious weed. The "New Mexico Non-Native Phreatophyte Management Plan" (NMDA, 2005, page 10) describes tamarisk's reputed water use as a concern. The 2000-2004 New Mexico drought increased this concern. Research shows a number of variables interact to determine water consumption such as density, age, mix of vegetation, water quality, depth to ground water, and climate. Although no specific value can be applied because of these many variables, water consumption for tamarisk can generally be assumed to be about 25 percent more than a cottonwood/willow community and several times that of a dry land plant community. Although not scientifically evaluated for changes in the water balance, anecdotal evidence at Spring Lake near Artesia and Cejita Creek in Harding County near Roscbud has shown increases in water availability after tamarisk removal.

The Canadian River originates in the east slope of the Sangre de Cristo Mountains, of extreme southern Colorado, northwest of Raton, New Mexico. The river runs south and southeast from its origin and exits the state east of Ute Lake and Logan, New Mexico. The Canadian and its

tributaries is the major watercourse in northeast New Mexico and are the primary water source for Conchas and Ute Lakes. It is the major water supply for several irrigation systems and acequias, as well as various communities. The water of the Canadian River supplies thousands of acres of agriculture, recreation opportunities, livestock water, wildlife habitat, and is home to several indigenous wildlife species. An inventory of drainages in the Canadian River system estimates that tamarisk has invaded about 8,560 acres along the main stem and about 23,175 acres along its tributaries (CRRRP, 2004).

The New Mexico Soil and Water Conservation Districts throughout the Canadian River watershed, in concert with State agencies such as the New Mexico Department of Agriculture, have organized and developed the Canadian River Riparian Restoration Project (CRRRP) to address control of invasive species like tamarisk. The priorities of the CRRRP are tamarisk control, riparian vegetation restoration, long-term management, maintenance, and monitoring of the Canadian River. This group is working with private landowners, agencies such as the USDA Forest Service, local governments, and non-profit organizations across jurisdictional boundaries along the 290 miles of the Canadian River in New Mexico. The CRRRP developed the plan to control tamarisk starting at the headwaters of the drainage and moving downstream. One of the goals of the plan is to sequentially treat tamarisk infestations from upstream to downstream to reduce the potential for re-invasion from upstream seed sources. Over the last few years, the CRRRP treated about 3,820 acres of salt cedar on private and state lands along the Canadian River upstream from the Kiowa National Grasslands. To effectively control the species and reduce the potential for re-invasion, the Forest Service needs to address tamarisk infestations along the 16 miles of the river within the Kiowa National Grassland.

Purpose and Need for Action

Tamarisk has actively invaded riparian areas along the Canadian River, replacing native plants and wildlife, reducing plant and animal diversity. The Canadian River supplies irrigation water to thousands of acres of agriculture land, provides for recreational opportunities, and is home to many indigenous wildlife species. To help restore the hydrologic function of the Canadian River, the Kiowa National Grasslands needs to eradicate tamarisk (salt cedar) along the river corridor and its tributaries in both an effective and cost efficient manner. The need exists to promote the re-establishment of native riparian plant species and the wildlife habitat they provide.

The State of New Mexico Department of Agriculture and the Federal government both list tamarisk as a noxious weed. The State has recognized the impacts of tamarisk as an ecological crisis that needs immediate attention. Control of tamarisk also meets the intent of Forest Service regional priorities: (1) restore ecological functionality of Southwestern forests and rangelands, and (2) assist in protecting communities adjacent to national forests. This proposal is part of a multiagency and landowner cooperation effort to treat the entire Canadian River and halt the spread of tamarisk in the State.

This action is needed because tamarisk infestations on the Canadian River upstream of the Kiowa National Grasslands either have been treated or are scheduled for control treatment. To maximize the effectiveness of the tamarisk control program in the entire river corridor, the Forest Service needs to control the species on the portion of the river that traverses the Kiowa National Grassland. If the Forest Service does not control the plant on the Federal lands it manages, then downstream control treatments would be ineffective due to the biological characteristics of tamarisk. The species produces large amounts of seed that the river can transport downstream,

which would germinate and re-invade previously treated areas before native vegetation could occupy the sites.

This action responds to the goals and objectives outlined in the Cibola National Forest Land and Resource Management Plan (LRMP), and helps move the project area toward desired conditions described in that plan. The activities described in the proposed action are consistent with plan direction for the Kiowa National Grassland. Tamarisk control responds to the plan's goals for several resources (USDA FS 1985, pages 33 to 33-1):

- Riparian – emphasize protection and improvement projects for riparian areas.
- Wildlife and Fish Habitat – manage for a diverse, well-distributed pattern of habitats for viable populations of wildlife and fish species in cooperation with states and other agencies. Apply technology and manage habitat to help recover threatened and endangered species and increase productivity for existing native and nonnative vertebrate species consistent with other resource considerations. Resist introduction of exotics.
- Water – provide for favorable conditions of water flow that provide for long-term consumptive and nonconsumptive water quality needs through improved management technology.
- Soil – improve and maintain soil productivity and condition of watersheds and riparian areas.

The Cibola National Forest completed geographic area (GA) assessments for the Kiowa-Rita Blanca National Grasslands in 1999. This document expands on and complements the land and resource management plan information. The assessment identified Mills Canyon as one of three geographic areas on the unit. The Mills Canyon GA includes the Canadian River corridor. The assessment identified the following desired conditions for the Mills Canyon GA related to riparian, aquatic, and wetlands ecosystems (USDA FS, 1999):

- Riparian and wetland areas are healthy and functioning properly. A diversity of healthy native riparian/wetland vegetation species are present in quantities sufficient to: (1) filter sediment, capture bedload, aid in flood plain development, and stabilize streambanks against cutting action; (2) dissipate stream energy associated with streamflows, thereby reducing channel erosion and improving water quality; (3) maximize ground water recharge during high flows through improved flood water retention; and (4) provide for wildlife habitat diversity.
- Riparian-wetland areas are stable and functioning properly and meet LRMP standards and guidelines.
- Riparian vegetation community is healthy with species diversity approaching its potential.

Proposed Action

The Forest Service proposes to apply commercial formulations of the herbicide imazapyr to control tamarisk on about 540 acres of Federal administrative lands scattered along approximately 16 miles of the Canadian River (including tributaries and side drainages where tamarisk occurs), from just north of Biscante Canyon to just south of Whitman Canyon. The herbicide would be applied between late July and late September, using a variety of approved application methods

(i.e. aerial foliar spray by helicopter, mechanical treatments, and backpack spray). The proposal includes re-treatment of sprouting tamarisk for up to 5 years following initial treatment, as needed to control new growth. It also includes measures to re-establish native vegetation in the treated areas. The actions are consistent with the objectives, desired conditions, and standards and guidelines in the "Cibola National Forest Land and Resource Management Plan." See chapter 2 for a detailed description of the proposed action.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and the environmental consequences in order to make the following decisions whether to:

- implement tamarisk control treatments as described in the proposed action; or
- vary the design of the proposed action to meet the purpose and need through some other combination of activities; or
- take no action at this time.

Public Involvement

The Notice of Intent (NOI) was published in the Federal Register on May 13, 2005. The NOI provided for public scoping comment on the proposal through June 15, 2005. In addition, as part of the public involvement process, the Agency, on May 6, 2005, sent a letter describing the proposal and soliciting comments to interested and affected individuals and organizations. This scoping letter provided for comments until June 15, 2005. The forest also published a public notice in the May 25, 2005, edition of the Union County Leader newspaper notifying the local community of the project and the opportunity to provide scoping comments. On July 11, 2005, the Forest Service held a meeting in Roy, New Mexico, to brief the public on the project's progress and provide another opportunity to comment.

Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: (1) outside the scope of the proposed action; (2) already decided by law, regulation, forest plan, or other higher level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)...". A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

No significant issues were identified during public scoping that requires the development of an additional alternative that would be analyzed in detail. The responsible official determined that none of the comments received were significant, which does not mean that the issue does not merit examination, only that it does not require further development as an alternative.

Several members of the public identified the use of the herbicide imazapyr and its potential for unintended effects on people and the environment as a concern. Although the comments about herbicides did not merit inclusion as a significant issue, the ID team and responsible official considered alternatives to herbicides (see chapter 2).

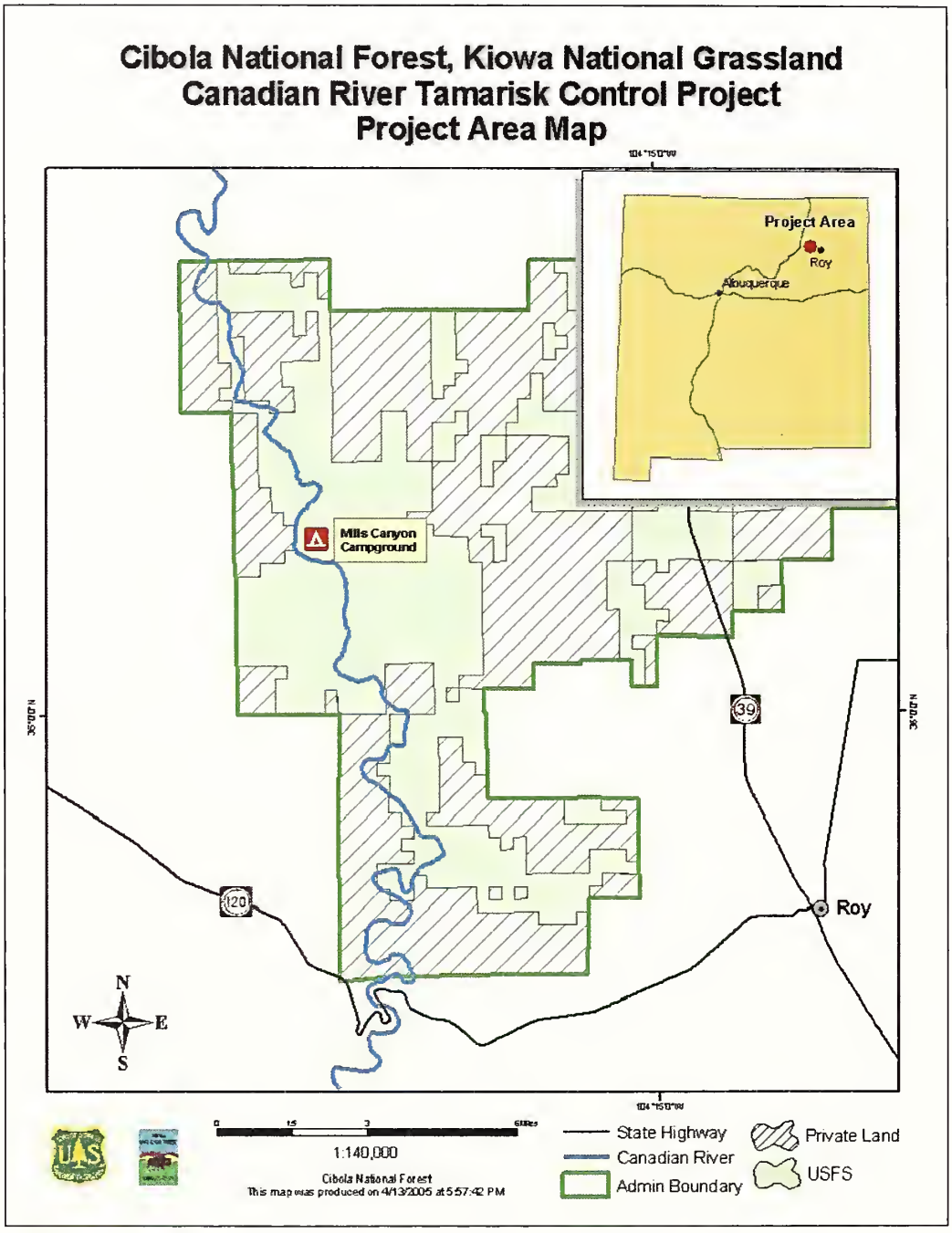

Figure 1. Map of the Canadian River on the Kiowa National Grassland where actions are proposed.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Canadian River Tamarisk Control Project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (the actions proposed in each alternative to achieve the project's purpose) and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

Alternatives Considered in Detail

The Forest Service developed two alternatives to consider in detail, the no action and proposed action. The IDT developed the proposed action using the principles of integrated vegetation management (IVM) as described in the New Mexico Interagency Weed Action Group's "Strategy for Long-Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River Systems, 2005-2014" (USDA FS 2005). IVM involves the use of a number of different treatment methods to control a pest, such as herbicides, prescribed fire, mechanical methods, and biological controls. Depending on the situation, all of these methods could be used separately or in combination. The advantage of using IVM is that each treatment method provides varying degrees of control that can increase when the methods are combined. The type of hydrologic system found in the river channel, the location of the tamarisk in relation to the channel, and the lack of access into most of the corridor restricts the type of treatment that is most effective or feasible in this situation.

Alternative 1

No Action

Under the no action alternative, current management plans would continue to guide management of the project area. No tamarisk control would be implemented to accomplish project goals.

Alternative 2

The Proposed Action

Apply the herbicide imazapyr (common trade names Arsenal® and Habitat ® or equivalent) according to label directions, using aerial and backpack spray methods. Aerial spray by helicopter would be used when tamarisk is too dense to be effectively controlled by backpack application or when the treatment area is inaccessible by vehicle (estimated 380 acres). Backpack spray (hand treatment) would be used after tamarisk has been cut with either chain saws or tractor, and the herbicide is applied to the cut stump, or the herbicide is applied over the top of stems as a foliar application (estimated 160 acres). Areas treated by backpack application would depend on location, access, and amount of native vegetation that needs protection. Treatments would be done between late July and late September, and includes spot re-treatment (using hand application methods) of sprouting tamarisk for up to 5 years following initial treatment, as needed to control new growth. See appendix A for a key map of the project area and finer detail maps of the treatment sites along the river.

1. Add a nonionic surfactant (common name Surf Ax 100® or equivalent) to ensure the herbicide sticks to the plant surface and gets absorbed by the foliage.
2. Add a drift control agent to reduce overspray and increase efficiency. Add a vegetable oil based compound (common trade name InterLock® or equivalent) to the mixture only for aerial spray applications.
3. Mix 64 ounces of herbicide and up to 5 ounces of surfactant and 2.5 ounces of drift control agent with water and apply at the rate of 1 pound acid equivalent of active ingredient per acre.
4. For aerial application, a helicopter equipped with a spray boom would apply the herbicide using a nozzle that can produce a droplet size of 1,000 microns, over a width of up to 45 feet in one pass.
5. Mechanical treatments would include one of the following depending on equipment availability and site terrain:
    a. Shredder with stump spray treatment
    b. Chain saws with stump spray treatments
    c. Shears with stump spray treatments
6. Mechanical treatments would occur in areas accessible by equipment and around Mills Canyon Campground on Federal lands. Use only existing roads and trails for access.
7. Rehabilitation efforts include:
    a. Leave dead trees standing for a minimum of 2 full growing seasons before removing.
    b. After 2 years following treatment, remove hazardous trees around Mills Canyon Campground and other accessible areas, as needed. Cut trees and pile material for burning or chipping.
    c. Allow dead trees in other areas to fall on their own over time.
    d. Replant treated areas as needed with native riparian species (cottonwoods, willows, rushes, sedges, and other riparian shrubs) following treatment activities. Use plants grown at the USDA Native Plant Materials Center from locally collected seed or rootstock.
    e. Reseed areas disturbed by equipment along with other selected areas with native grasses and forbs in order to stabilize the soil and provide ground cover.

Mitigation Measures

The Forest Service also developed the following mitigation measures to implement as part of the proposed action. The IDT incorporated best management practices (BMPs) to protect soil and water resources. BMPs are consistent with regional guidance in Forest Service Handbook (FSH) 2509.22 - (R3) Soil and Water Conservation Practices Handbook. Measures incorporated to meet BMPs are identified in the following list.

Measures to use during herbicide spray activity:

- In aerial spray projects use GPS technology to reduce off-target aerial spray of herbicides during application (BMP).
- Do not spray when winds exceed 10 miles per hour (BMP).

- Do not spray when humidity levels are less than 10 percent or temperatures exceed 92 °F (BMP).
- Do not aerial spray during bird nesting season (April thru mid-July).
- Close Mills Canyon and Mills Canyon Campground to the public during spray operations and for 1 day following treatments (re-entry period) for health and safety reasons.
- Wash picnic tables in Mills Canyon Campground with water and soap solution to remove herbicide residue immediately following spray application.
- Post notifications of herbicide application at appropriate locations.
- Prepare and implement a spill prevention and cleanup plan – see appendix B for an example (BMP).

Measures to implement in conjunction with mechanical or hand treatment:

- Mechanical and/or hand treatment only on Forest Service administered lands.
- Mechanical and/or hand treatment in areas with high concentrations of native species (i.e. cottonwood galleries, willow thickets) and adequate access.
- Within the Mills historic ranch site, restrict all ground-disturbing activities to those areas where tamarisk is established, and avoid all features and structures.
- Limit mechanical treatments to slopes less than 40 percent, stems greater than 6 inches in diameter, and areas accessible by existing roads and trails (BMP).
- Clean equipment prior to entering treatment area when coming in from an area with known weed infestations.

Measures to implement when control activities are complete:

- Within the Mills historic ranch site, if cut tamarisk is burned, hand pile materials for burning and avoid all structures and features.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives would not meet the purpose and need for action in this project's environmental setting or included actions that would cause unnecessary environmental harm. Therefore, the ID team and responsible official considered several alternatives, but dismissed them from detailed consideration as discussed below.

Use of Mechanical Treatments to Control Tamarisk

Forest Guardians, in their scoping comments, suggested the use of equipment to remove tamarisk from the Canadian River flood plain. The proposal was for a backhoe type of machine that could pull the tamarisk, including roots, from the ground. No herbicides would be used and sprouts would be treated by hand pulling each year.

The interdisciplinary team considered this alternative but eliminated it from detailed study because of the lack of road access into much of the river flood plain. Of the 16 miles that need treatment, only about 4 miles have roads that provide access to tamarisk stands. In addition, in the areas with access, such as around Mills Canyon Campground, tamarisk grows across the top of soil berms that protect the campground from flooding. Pulling the tamarisk out by the roots would cause damage to the berms and their subsequent failure. The Canadian River through this stretch is a canyon-confined system that is up to 800 feet deep in some sections. Severe changes in the hydrological cycles due to flash flooding and upstream storm events characterize this system. The flood plain itself is narrow and often the tamarisk is located right along the water's edge and against the sheer rock canyon wall. For these reasons it is infeasible to use a piece of equipment along the river corridor without causing excessive damage and erosion to the streambanks, or without compromising safety.

This alternative would not meet the purpose and need to restore the hydrological function by controlling tamarisk in the Canadian River using a method that is both effective and cost efficient.

Use of Livestock to Control Tamarisk

In some situations, livestock, such as goats, have been used to control tamarisk along river corridors and other areas. This type of treatment works well in areas where there is a wide flood plain and access for the herders. Goats are effective if the trees are small enough for the animals to reach and if the treatment is applied several years in a row. The interdisciplinary team discussed this alternative but recommended to eliminate it from detailed study because of poor access and the potential effects to the river cut banks from hoof shearing. The large area that needs treatment (over 500 acres) would require a substantial herd size that may not be economical. Much of the tamarisk is tree size, which makes control by livestock difficult.

This alternative would not meet the purpose and need to restore the hydrological function by controlling tamarisk in the Canadian River using a method that is both effective and cost efficient.

Use of Fire to Control Tamarisk

Fire can be an effective tool for reducing fuel loads associated with buildup within tamarisk stands. However, fire alone is ineffective at controlling tamarisk because it only kills the above ground portion of the plant, leaving the below ground root structure to re-sprout. Tamarisk is a fire-adapted species that sprouts vigorously after burning. Fire has also been known to stimulate flowering and seed production as a survival response. Even though fire can reduce tree growth and keep stands from reaching maturity, eradication or sufficient control with fire alone is unlikely to occur.

This alternative would not meet the purpose and need to effectively control tamarisk given that fire increases sprouting and seed production.

Use of Biological Agents to Control Tamarisk

Several western states have used a non-indigenous leaf beetle, *Diorhabda elongata*, as a control treatment for tamarisk. The salt cedar leaf beetle originates in central Asia where it defoliates large areas of tamarisk. The USDA's Animal and Plant Health Inspection Service (APHIS) has not approved its general release in New Mexico. APHIS recently approved the release of the leaf beetle in New Mexico on an experimental basis, but the release does not include the Mills Canyon area. For this alternative to be effective, the size of the tamarisk stands must be large

enough to support populations of insects. Tamarisk in the Canadian River is widely distributed along the length of the river system, from the Colorado border through Texas. However, the stands on Forest Service administered lands do not extend very far from the flood plain, thus not providing a large enough area for this type of treatment to be effective. In addition, use of the salt cedar leaf beetle has been effective only for reducing the abundance of tamarisk, not for eradication or significant control.

The U.S. Fish and Wildlife Service raised concerns about impacts to native listed species where the beetle may impact habitat or directly affect listed plants. Since approval for the release of the beetle in New Mexico does not exist at this time and stand conditions do not meet the characteristics that are optimal for use of leaf beetles, this alternative was not considered in detail.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in table 1 focuses on the project objective and environmental aspects where different levels of effects can be distinguished quantitatively or qualitatively among alternatives.

Table 1. Summary and comparison of the effects of the alternatives on the physical, biological, and social environment

Environmental Aspect	Alternative 1	Alternative 2
Control of Tamarisk	There would be no reductions in the amount of tamarisk. Tamarisk would continue to dominate riparian areas along the Canadian River. Tamarisk would expand from its current locations. Mixed stands would eventually become salt cedar monocultures.	Expect control of up to 95 percent of the tamarisk with one treatment. Limited re-treatments would be needed to prevent new infestations or re-establishment in treated areas.
Vegetation	Under this alternative, tamarisk infestations would expand. The amount of tamarisk would increase through two modes: (1) expansion of existing infestations, and (2) creation of new infestations. The expansion of existing infestations would be the primary mode of infestation increase. The approximately 160 acres of mixed tamarisk/cottonwood/willow stands would gradually become tamarisk monocultures. Over time, tamarisk would expand to the extent of suitable habitat. Because the species produces large amounts of highly mobile, viable seeds throughout the growing season, new infestations would likely develop in the remaining	With up to 95 percent control, there would be many dead salt cedar "skeletons" in the Canadian River riparian area. In some infestations, a narrow band of willows exists between the river and the tamarisk. Where herbicide is aerially applied, some spray of the willows would be unavoidable. It is likely that some of the willow would be killed. Dead tamarisk would be left undisturbed for 2 years after treatment to prevent stimulation of root sprouting. Grasses and herbaceous species that exist along the margins of the infestations would re-colonize the areas first. As floods disturb the riparian zones, willows and cottonwoods would become established from nearby seed sources. Because most infestations are restricted to a relatively narrow band

Environmental Aspect	Alternative 1	Alternative 2
	unoccupied riparian zones throughout the canyon. Over time, tamarisk would dominate all the riparian zones in the canyon. There would be a reduced amount of native riparian vegetation. The potential exists for infestations to expand outward from the riparian zone.	along the river, this re-colonization would be relatively rapid. In wider areas or those that do not adequately revegetate naturally, cottonwoods, willows, rushes, sedges, and riparian shrubs would be planted. Infestations that occur in mixed stands with native species (about 160 acres) would be treated with a combination of cutting and hand application of imazapyr. Salt cedar would be controlled with little to no direct effect on adjacent native vegetation. Some site disturbance from mechanical cutting would occur. Sites disturbed by equipment would be reseeded with native grasses to stabilize the soil and provide immediate ground cover. These areas may recover more rapidly to native vegetation than those that are aerially sprayed because of the disturbance and seeding. The mixed species composition in these areas would lead to more rapid recovery of native vegetation in the hand-sprayed sites. The native species already exist and would provide ample seed to revegetate the locations where salt cedar would be controlled.
Soil and Water	Ongoing site degradation would continue to occur from excessive water use by tamarisk and from salts deposited on the ground through leaf litter. Alkalinity in the surface soil and water quality may be adversely affected—runoff and seepage through the soil into the stream channel can carry the salts into the water increasing its salinity. Increased sediment delivery to drainages would affect the hydrologic functionality of streams through increased turbidity levels and deposited sediments. Channel narrowing and subsequent bank stabilization caused by tamarisk creates a more immobile or inflexible stream channel that progressively restricts channel dimensions by	As salt cedar is controlled and native vegetation becomes established, the potential for adverse effects on hydrologic conditions along the Canadian River would decrease. Controlling tamarisk would reduce further degradation of hydrologic functions that would occur if the plant continues to expand along the river. As native vegetation becomes re-established, hydrologic processes would return to conditions that are more normal. This would reduce the likelihood of increased erosion, surface runoff, and sediment delivery. This would result in improved channel stability and better runoff conditions compared to existing conditions. Control actions would greatly reduce or eliminate water use by tamarisk, which

Environmental Aspect	Alternative 1	Alternative 2
	increasing sediment deposition from flooding. The force of flow during storm events increases the potential for flooding. As floodwaters recede, tamarisk has the opportunity to encroach further into the channel. A reduced channel width also causes an increase in velocity and transporting power of the water during runoff from strong storms. This may cause scouring and a deepening of the channel.	would improve watershed condition. Tamarisk removal would make more ground water available for native plants. It may also increase flow in the channel for downstream use, although research on increased water flow due to tamarisk reduction is incomplete or inconclusive.
Wildlife – Threatened and Endangered Species **Sensitive Species** **Management Indicator Species**	T&E—The bald eagle is a rare winter visitor; there are no nesting bald eagles within the Canadian River drainage. The Arkansas River shiner is a small minnow native to wide, sandy-bottomed streams of the Arkansas River drainage; it is presently almost entirely restricted to the Canadian/South Canadian River in Oklahoma, Texas, and New Mexico. There would be no direct effects on the bald eagle. There would be no direct effects to the Arkansas River shiner habitat. An indirect effect would be the increase and continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage, which might create an increase in ephemeral stretches of river that would not be available to Arkansas River shiner or other native fish and aquatic organisms. Sensitive Species—Although not detected during surveys in the area, habitat exists for the yellow-billed cuckoo and the Canadian speckled chub. There would be no direct effects on yellow-billed cuckoo. Cuckoos nesting in riparian areas prefer cottonwood galleries with an established willow understory—the increase in salt cedar throughout the Canadian River drainage would result in loss of cuckoo habitat. The effects on Canadian speckled chub would be the same as described for the	T&E—Activities would not affect the bald eagle or its foraging or winter habitat quality, since implementation would occur in late summer (mechanical) and fall (aerial application in August and September). Salt cedar treatment under the proposed action would not target any of the large ponderosa pines and cottonwood galleries which could provide potential winter roost and perch sites. There would be no direct effects on the Arkansas River shiner or its habitat. Mechanical treatment may affect habitat indirectly through increased sediment in the river due to soil disturbance; actual amounts would be minimal and targeted to small areas over a short time period. A positive indirect effect would be an increase over time in native trees and shrubs along the shoreline. Herbicide imazapyr may enter streams through overspray, leaching, or runoff. Studies have shown it is not toxic to fish at the application levels that woud be used. Sensitive Species—There would be no direct effects to yellow-billed cuckoo since they are not likely to inhabit the area (no cuckoos were detected during breeding bird surveys conducted from 1993-2002). Indirect effects to cuckoo habitat may include temporary loss of cover habitat, and reduction in insect abundance until new vegetation becomes established in the understory, since aerial spraying will remove salt cedar foliage. Establishment of native

Environmental Aspect	Alternative 1	Alternative 2
	Arkansas River shiner. Management Indicator Species—Two MIS exist for the Kiowa NG, long-billed curlew and grasshopper sparrow. The project area consists mostly of canyon habitat in ponderosa pine, pinyon/juniper, flood plain and riparian habitat along the Canadian River, and is not located in suitable grassland habitat utilized by either of the MIS species. Habitat quality would not be impacted.	cottonwood galleries and willow stands would offset these temporary losses in the future. The effects on Canadian speckled chub would be the same as described for the Arkansas River shiner. Management Indicator Species—There will be no direct or indirect impacts to these MIS since activities are not located in suitable grassland habitat utilized by the species.
Recreation and Scenery Management	Recreation—Tamarisk would continue to be a dominant species in the riparian area and continue to affect recreation access to the river. Projected increases in tamarisk would further reduce connection to the river. While trails have developed from the campground, it is difficult to reach the river, with only a few access points on the sediment berm that has developed under the tamarisk. The potential for solitude would not be affected. There would be an impact to bird watchers, where loss of native habitat changes bird species composition. Scenery—Tamarisk will continue to be a visual element along the riparian area of the Canadian River. Viewers who are not aware that tamarisk is an invasive species may see the plant as enhancing the scenic quality. If a viewer is aware that they are not native to this region and concerned about impacts to the native species, tamarisk may be seen as detrimental and not enhancing the scenic quality.	Recreation—Impacts would be intermittent over the treatment period. Some temporary disruption of recreation use since access to the canyon would be closed during aerial spray activities. There will be additional noise and workers mechanically cutting tamarisk, applying herbicide, and using vehicles to transport workers. Since this canyon is remote and not intensively used, this activity may reduce the quality of the experience for visitors who desire solitude. The activities associated with the proposed action may also change hunting patterns. Presence of workers may influence where hunters choose to hunt if the treatment occurs during hunting season. As treatments reduce the amount of tamarisk, access to the river would improve for visitors. Over the next 5 to 10 years willows and cottonwoods would re-establish in areas previously occupied by tamarisk. This may enhance birdwatching opportunities and create the shade that improves fish habitat. Scenery—There would be a short-term loss of scenic quality for the first 2 years, while dead tamarisk stems are visible. The herbicide imazapyr does kill other species of plants, and there may be some collateral loss as well, although the application methods are very precise. This short-term loss of quality would meet the Visual Quality Objective of

Environmental Aspect	Alternative 1	Alternative 2
		Partial Retention, where management activities remain visually subordinate to the characteristic landscape. The impacts to scenic quality will be reduced as the number of tamarisk stems decline due to cutting or decomposition. Establishment of native willows and cottonwoods would enhance scenic quality.
Heritage Resources	Unlikely to affect heritage resources since very few known resources exist in zones where tamarisk grows.	There would be no adverse effect because ground-disturbing project activities would be confined to the river channel or within the gaps between the features of the recorded site. Other known heritage resources in the canyon are mainly found on river terraces and benches above the flood plain outside treatment areas. Proposed mechanical treatment areas are near the known site, and have been previously surveyed for heritage resources. Due to the nature of the braided stream channel where tamarisk grows, the potential for heritage resources in this area is very low.
Public Health and Safety	No direct effects	Potential health risks to workers could include injuries from the manual and mechanical actions taken to control salt cedar. These are relatively minor and include cuts, burns, abrasions, fractures, skin irritation and allergic reaction during the use of chain saws and or shears. There could also be accidental fuel spills using this equipment. Workers could face direct herbicide exposure, either during the mixing process, application process or monitoring process. Exposures to imazapyr do not lead to estimated doses that exceed a level for concern for either workers or members of the general public at the application rate. Herbicide use would not affect worker and public health and safety.

Chapter 3. Affected Environment and Environmental Consequences

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for comparison of alternatives presented in the alternatives chapter.

Vegetation

Affected Environment

Tamarisk infestations are scattered along about 16 miles of the Canadian River in Mills Canyon. The infestations are primarily restricted to streamsides and riparian zones along the river. Infestations range in size from less than an acre (a cluster of a few stems) to those several acres in size that completely dominate the site (salt cedar monoeultures).

The well-established infestations are usually monocultures of tamarisk. Tamarisk has displaced native overstory species such as cottonwood, willow, and maple. Understories are generally devoid of grassy and herbaceous vegetation. In some areas along the river, periodic disturbance from flooding has allowed willow to beeome established immediately adjacent to the river's edge. These narrow bands of willow are generally no more than 5 to 10 feet wide and are often overtopped by the tamarisk crowns.

Environmental Consequences

Alternative 1: No Action

Under this alternative, tamarisk infestations would expand. The amount of tamarisk would increase through two modes: (1) expansion of existing infestations, and (2) creation of new infestations.

The expansion of existing infestations would be the primary mode of infestation increase. The approximately 160 acres of mixed tamarisk/cottonwood/willow stands would gradually become tamarisk monocultures. Over time, tamarisk would expand to the extent of suitable habitat. Because the species produces large amounts of highly mobile, viable seeds throughout the growing season, new infestations would likely develop in the remaining unoccupied riparian zones throughout the canyon. Over time, tamarisk would dominate all the riparian zones in the canyon. There would be less native riparian vegetation.

The potential exists for infestations to expand outward from the riparian zone. This lateral expansion would be slow due to drier conditions and increasing depth to the water table that would inhibit successful invasion by tamarisk seedlings. In the current drought conditions, soils in these areas dry too quickly for tamarisk seedlings to become established. If the drought ends, soil conditions could become favorable for their establishment. More rain would increase soil moisture, which could then provide sufficient moisture for tamarisk seedlings to develop a taproot that contacts the water table. Because of the species rapid root growth, it has a competitive edge over native plants. Tamarisk would displace native grass and herbaceous and woody vegetation in the areas where it becomes established.

Cumulative Effects

The Canadian River Riparian Restoration Project (CRRRP) plans to conduct additional tamarisk control actions on other private, State, and Federal lands downstream from the Mills Canyon area. Without treatment of infestations in Mills Canyon, the downstream control actions would be ineffective. Infestations in Mills Canyon would produce seed that the river transports to these downstream locations. This would provide a constant source of new tamarisk seedlings.

Alternative 2: Proposed Action

Based on results achieved in other similar control operations, herbicide treatment would result in 85 to 95 percent effectiveness (Hart et al. 2005, Tamarisk Coalition 2005). At this effectiveness rate, only scattered tamarisk would remain after initial treatment. Followup treatments to control these individuals would be done.

In some infestations, a narrow band of willows exists between the river and the tamarisk. The tamarisk canopy overtops many of these willows. The dense tamarisk foliage would intercept most of the herbicide, but some spray of the willows would be unavoidable. Additionally, some intermixed stands of cottonwoods, willows and tamarisk would also be killed. Some intermixed stands are not accessible by road or trail and cannot be hand treated to remove only the salt cedar. Dead tamarisk would be left undisturbed for 2 years after treatment to prevent stimulation of root sprouting. Although dead tamarisk would be left undisturbed, it does not mean that the areas would remain devoid of vegetation. Grasses and herbaceous species that exist along the margins of the infestations would re-colonize the areas first. As floods disturb the riparian zones, willows and cottonwoods would become established from nearby seed sources. Because most infestations are restricted to a relatively narrow band along the river, this re-colonization would be relatively rapid. Followup treatments would have little effect on recovering native vegetation. Future treatments would be spot spraying of individual tamarisk plants. These stem-specific applications present little opportunity to affect adjacent vegetation. Monitoring has been done on vegetation responses to tamarisk control upstream on the Canadian River near Maxwell. This area was treated in 2004 in the same manner as proposed for this project. Not enough data exists at this time to make interpretation reliable, but treated areas exhibited an average 95 percent control rate and vegetation was naturally re-establishing (NMSU, 2007). In wider areas or those that do not adequately revegetate naturally, cottonwoods, willows, rushes, and sedges would be planted. The planting could begin as soon as 6 months following initial treatment. Since treatments are planned for late summer or early fall, planting would be possible the first spring after spraying the tamarisk if planting is done by hand and does not disturb the tamarisk roots (which could stimulate sprouting). Plants established from local (Mills Canyon) seed and cuttings are being grown at the USDA Plant Materials Center in Los Lunas, New Mexico. The Plant Materials Center will make these seedlings available for transplanting back within the natural system from which they were originally collected.

Most infestations that occur in mixed stands with native species would not be aerially sprayed. All of the estimated 160 acres of mixed salt cedar stands that are accessible by road or trail would be treated with stem-specific applications. The vegetation effects would be similar to those described for aerial spray treatment. There would, however, be little to no direct effect on adjacent native vegetation. Some site disturbance from mechanical cutting would occur. Sites disturbed by equipment would be reseeded with native grasses and forbs to stabilize the soil and provide ground cover. These areas may recover more rapidly to native vegetation than those that are aerially sprayed because of the disturbance and seeding.

The mixed species composition in these areas would lead to more rapid recovery of native vegetation in the hand-sprayed sites. The native species that already exist would provide ample seed to revegetate the salt cedar control locations.

Cumulative Effects

Future treatments downstream from Mills Canyon on other ownerships would be more effective in controlling tamarisk. There would be far fewer seeds produced from Mills Canyon infestations, reducing the probability of re-infestation of downstream treated areas.

Since the Canadian River in Colfax County upstream of Mills Canyon was sprayed in 2004 to control salt cedar, it is less likely that re-infestation from off-site seed sources would occur. Few other activities that affect vegetation are planned in Mills Canyon. Minor prescribed burning projects have been conducted (about 120 acres in 2003) or are planned (about 70 acres) in the canyon. A decision to relocate Mills Canyon Campground out of the flood plain would reduce the potential for effects on vegetation. The cumulative effect of these previously completed and planned future actions would be to improve composition of the riparian vegetation.

Soil and Water

Affected Environment

Mills Canyon lies about 6 miles west of the communities of Mills and Roy, New Mexico, within the Mills Canyon Geographic Area. This geographic area lies entirely within the Upper Canadian River watershed. The canyon ranges from about 700 to 900 feet deep in the Forest Service portion and is composed of canyon bottoms and canyon sideslopes. Interbedded layers of sandstone and shale comprise the geology of the area. Mean annual precipitation is about 15 inches. The canyon bottom, which includes the river corridor, is composed of the stream channel and associated flood plains and terraces. Two terrestrial ecosystem survey (TES) units, designated 820 and 821, comprise the canyon bottom.

TES unit 820 includes the flood plains, terraces and stream channel. TES unit 820 is subject to periodic flooding—some are severe—from strong storms. The soils are mostly sandy or in coarse textured families of Haplustolls, with some cobble and stone content. This unit is further subdivided into three soil components:

Component 1 - sandy loams occupying high terrace positions farthest away from the channel.

Component 2 - gravelly and cobbly sandy soils on lower flood plain positions closer to the stream channel.

Component 3 - alternating layers of silty, sandy or clayey material that border the stream channel.

Old terraces, also part of the canyon bottom, make up TES unit 821. The soils are mostly in fine-loamy families of Argiustolls. There are small areas of weakly developed sandier soils prone to gully erosion within this unit. TES unit 821 rarely floods but soils have low bearing strength when wet.

In the Canadian River Canyon bottom, tamarisk (*Tamarix ramosissima*) has occupied and dominated sites along the river channel. This small tree or shrub with a deep root system (up to 100 feet deep) uses large amounts of ground water and leaves a salt residue on the soil surface.

Under the favorable conditions found in Mills Canyon it has replaced native cottonwoods, willows, forbs and grasses. The resulting salt cedar thickets have invaded and dominated the banks of the Canadian River, providing poor habitat for flora and fauna, increased the fire hazard, limited human access to the waterway, and generally consume more water than native vegetation.

Environmental Consequences

Alternative 1: No Action

Tamarisk would continue to occupy and dominate streambanks and riparian areas along the Canadian River. Native plant species of Fremont cottonwood, coyote willow and native understory forbs and grasses would be prevented from establishing. Site degradation would continue to occur from excessive water use by tamarisk and from salts deposited on the ground through the leaf litter. Native plants would have difficulty in germinating because of the increase in salts. This often leads to an increase in bank and riparian erosion and sedimentation as grasses that contribute to soil stability cannot germinate under tamarisk. Alkalinity in the surface soil and water quality may be adversely affected—runoff and seepage through the soil into the stream channel can carry the salts into the water increasing its salinity.

Increased sediment delivery to drainages would affect the hydrologic functionality of streams through increased turbidity levels and deposited sediments. Sediments deposited on channel bottoms can reduce the interchange of surface and subsurface waters in the hyporheic zone beneath stream channels (Nelson et al. 1991). Excessive sediments deposited in the channel, if not carried downstream, can form islands and point bars and eventually become inhabited by salt cedar. These new land features can alter the carrying capacity of the streams and lead to narrowing and down cutting of the channel, as well as increased flooding and diverting of waterways from their natural flow paths (Chamberlin et al. 1991).

Channel narrowing and subsequent bank stabilization caused by tamarisk creates a more immobile or inflexible stream channel that progressively restricts channel dimensions by increasing sediment deposition from flooding. The force of flow during storm events increases the potential for flooding. As floodwaters recede, tamarisk has the opportunity to encroach further into the channel. A reduced channel width also causes an increase in velocity and transporting power of the water during runoff from strong storms. This may cause scouring and a deepening of the channel. Scouring can cause loss of gravel that provides habitat for aquatic organisms, loss of instream structure (woody debris) for pool habitat and lowering of the water table near the streambank. In general, narrowing of the channel reduces the amount of stream habitat and ecosystem per unit of channel length.

The prolonged existence of thickets of tamarisk along the river would continue to increase the fire danger. Fire frequency seems to increase in tamarisk-infested areas—this suggests that tamarisk is a fire adapted species and promotes the flammability of plant communities where they grow. Frequent fires would remove litter, increase runoff and possibly cause some sterilization of the soil from intense heat. Sites infested with tamarisk prior to a fire typically revegetate with more tamarisk after a fire so the risk of fire remains.

Cumulative Effects

Other activities that occur in Mills Canyon and would continue to occur in the foreseeable future are recreation in the canyon bottom on or near established campgrounds and picnic areas, relocation of Mills Canyon Campground, and prescribed burning. OHV use would continue and

create incised paths from wheel pressure, which may lead to accelerated erosion within TES units 820 and 821. Firewood cutting on the uplands around the canyon rim may cause increased runoff into the canyon adding to the amount of floodwater and sedimentation. The last prescribed burn in the area was in 2003. The district conducted a wildlife habitat improvement prescribed burn on 120 acres of pinon-juniper woodland. Prescribed fire alters vegetation structure, which would temporarily reduce ground cover, resulting in reduced plant water use and increased potential runoff. If thunderstorms occur during this period, runoff would likely have increased amounts of suspended sediment. Ground cover in the form of grasses and litter quickly recovers, usually within a year, and reduces runoff. These effects will hold true for any future prescribed burns that include strips up to the canyon rim, but the high amounts of rock fragments covering the soil surface would mitigate the potential for soil movement. These rock fragments reduce the amount of bare soil and create check dams in certain locations on the slope. A decision made in 2006 would move the campground from its present site in the canyon bottom to a new location to the east to remove it from the area susceptible to a 100-year flood event. Improvement of the facility would have no effect on the tamarisk and quality recreation would still decrease.

The impacts from ongoing OHV use, camping, and wildlife and vegetation projects combined with the effects of taking no action on tamarisk infestations could cause further degradation of the river and its riparian area.

Alternative 2: Proposed Action

Implementing the proposed action would reduce or eliminate tamarisk along the stream margins. Native vegetation, including cottonwoods and willows would be re-established where tamarisk is removed. Vegetation recovery would begin relatively rapidly, with forbs and grasses from adjaeent areas colonizing the areas first. Seeding of disturbed areas with native grasses and forbs would also provide for timely re-vegetation. In addition, planting of new trees, sedges and other vegetation could begin as soon as 6 months following initial treatment. As these changes occur, the potential for adverse effects on hydrologic conditions due to loss of vegetation along the Canadian River would decrease. Controlling tamarisk would reduce further degradation of hydrologic functions that would occur if the plant continues to expand along the river. As native vegetation becomes re-established, hydrologie processes would return to conditions that are more normal. This would reduce the likelihood of increased erosion, surface runoff, and sediment delivery. This would result in improved channel stability and better runoff conditions compared to existing conditions.

Control actions would greatly reduce or eliminate water use by tamarisk, which would improve watershed condition. Tamarisk removal would make more ground water available for native plants. It may also increase flow in the channel for downstream use, although research on increased water flow due to tamarisk reduction is incomplete or inconclusive. A several year study of tamarisk control and its effects on water salvage on the Pecos River (Hart, et al. 2005) reported increases in ground water but could not identify changes in the water yield in the river. Flood risk would be lower because the channel narrowing effect caused by dense stands of tamarisk would no longer exist. Existing trails and roads would be used for access so minimal and localized soil disturbance and possibly increased sedimentation near channels is anticipated. These effects would be most likely on the approximately 160 acres of tamarisk control where mechanical equipment is used. These effects, however, would be minor and temporary in duration because of the relatively few numbers of acres treated in this manner.

Imazapyr is chemically stable in soil. The commercial herbicides Arsenal and Habitat contain about 28 percent imazapyr and 72 percent inert ingredients. Microbial activity primarily controls the breakdown and persistence of imazapyr in soil. Percolation and runoff also contribute to the removal of the chemical. A reasonable range for half-life, the time required for the concentration of the chemical to decrease by one-half, seems to be from 1 to 5 months (Tu, et al. 2001). In studies for sandy soils the half-life is about 70 days under 10 inches of annual rainfall. A half-life of 70 days is relatively short, but chemicals could move offsite in surface or ground water within this time.

The potential exists for herbicide to enter ground water or surface water through leaching, runoff, or direct spray. Soil characteristics determine the potential for herbicide movement in the soil profile (leaching) or soil runoff.

The herbicide that reaches the surface layer of the soil would be available for leaching. Soil attenuation capacity, water infiltration and soil permeability are the major factors affecting leaching. Several soil properties control these factors, including soil texture, surface layer thickness, organic matter content, structure, bulk density, permeability of soil or bedrock, depth to rock, depth to water table, and slope. Based on the properties of TES 820, the depth to a soil layer where herbicide may move laterally in solution through very permeable material is very near the soil surface in components 2 and 3. These are the soil components closest to the stream channel. Although component 1 is further away from the channel and depth to a very permeable layer is greater than 5 feet, because the amount of clay in the soil is low, the capacity of the soil to retain the chemical is low. In general, based on soil properties in the areas to be treated, whatever chemical lands on the soil surface is likely to leach and migrate into the water table and ultimately into the channel.

Herbicide could also move offsite loss in surface soil runoff. Rather than being lost through leaching through the soil profile, this type of herbicide loss would result if the chemical moves in runoff solutions or attached to sediments suspended in solution moving in surface runoff. Soil type and slope are major determining factors in surface loss; these affect rates of runoff and erosion. Soil can also leave the site through flooding, a consideration because it has the ability to remove large quantities of chemicals, either in solution or by sediments in solution, in a single event.

The soils adjacent to the river present slight to moderate loss potential due to runoff and slight to severe loss potential due to flooding. The soil along the river edge has the greatest potential for soil runoff due to steeper slopes (about 8 percent) than those away from the river. Since soil component 3 is closest to the stream channel, any chemical applied to tamarisk and that falls to the ground in this area is likely to runoff into the stream. The flooding frequency in soil components 2 and 3 in ecological unit 820 may be occasional or frequent, indicating a surface loss rating of moderate or severe. A chemical applied to tamarisk that falls to the ground in this area may remain on the soil long enough to be subject to removal by flooding from runoff from thunderstorms.

Although imazapyr that lands on the soil may enter water through leaching, surface soil runoff, or flooding, it would not present an appreciable risk to water quality because the chemical rapidly decomposes in water. Depending on rainfall frequency, imazapyr will remain available for uptake by plants for about 3 months unless storm events and subsequent percolation move the chemical into the stream where it will photodegrade in about 2 days.

In ecological unit 820, soil component 3 has the highest amount of clay and the greatest capacity to retain imazapyr, but because the soil is alkaline with pH above 8 the chemical will be weakly bound to soil particles. After 3 months, because of microbial breakdown and soil leaching loss, the amount of chemical left in the soil will be very small.

For ecological unit 820, soil components 1 and 2, the soils are very sandy and amount of clay is low. The capacity for imazapyr to adsorp to soil particles is very low. The primary effect will take place by the chemical being adsorbed through the foliage of the tamarisk. The herbicide that lands on these soils will be leached offsite into the water table and eventually into the stream channel. But because the chemical is nontoxic to fish and is rapidly degraded by sunlight—negative impacts are considered to be low. Imazapyr has a low toxicity rating and is not persistent in open water (Durkin and Follansbee, 2004). Michael (2003) documented that no adverse effects have been attributed to imazapyr or other herbicides typically used in forestry operations, even at application rates up to 100 times their normal use level.

Cumulative Effects

The effects of leaching and runoff of herbicide suspended in water, considered in conjunction with other activities of recreation, degradation of the tamarisk stems, planting and establishment of native speeies, OHV use and improvement of channel morphology would be of low impact to the ecosystem. Prescribed burning may temporarily increase runoff because of the reduction in ground cover on canyon side slopes, but the high amounts of rock fragments on the soil surface mitigate the effect. Imazapyr will not remain in the system for long periods. Small amounts of the chemical may move with soil particles or exude from roots of target species to cause off target damage to some desirable plants, but cumulative impacts would be minimal.

Similar treatment of tamarisk on private property along the Canadian River in the area has been and will continue to occur. This is primarily aerial application of Arsenal and Habitat. Effects on soil and water resources on private land will be similar to those described for Federal land. Additional herbicide use in the watershed is unlikely to result in cumulative water quality effects other than the long-term improvement in streamflow and stream geomorphology. Treating beyond Federal land boundaries would help to ensure positive results in the watershed.

Wildlife

Affected Environment

The Canadian River drainage provides a diversity of vegetation, climate and geology, which in turn provides habitat for a variety of wildlife and fish species. The riparian corridor, canyon walls and adjacent pinyon-juniper habitat with stringers of ponderosa pine provide habitat for golden eagle, prairie falcon, elk, mule deer, black bear, mountain lion and many small mammals, reptiles, waterfowl and neotropical migratory birds. The focus of this project will be the riparian corridor immediately adjacent to the Canadian River and the confluence of its tributaries located on national grassland.

The Endangered Species Act of 1973 requires that all Federal agencies and departments attempt to conserve threatened, endangered and proposed (T, E & P) species. Based on information provided by the U.S. Fish and Wildlife Service, five T&E species may occur in Harding and Mora Counties (table 2). A biological evaluation and assessment (BA&E) analyzes the effects to these species. There are no T&E plants or species proposed for Federal listing within the project

area. The Canadian River is the boundary between both Mora and Harding Counties. From its east boundary along the river, Mora County extends into the mountain range west of I-25. This makes a difference as to which species actually exist within Mora County versus the Canadian River drainage.

Ten Regional FS sensitive species may be present or within the vicinity of the project area. The management objective for species on the Regional Sensitive Species list is to keep these species off the Federal lists. Proactive planning and management efforts ensure that these species and their habitats are considered and impacts mitigated to prevent any trend toward Federal or State listing. The BA&E analyzes the FS sensitive species listed in table 3.

Table 2. Threatened and endangered species identified by USFWS as having habitat or potentially existing in Mora and Harding Counties

Scientific Name	Common Name	Status *
Empidonax traillii extimus	Southwestern Willow Flycatcher	E
Strix occidentalis lucida	Mexican Spotted Owl	T
Haliaeetus leucocephalus	Bald Eagle	T
Mustela nigripes	Black-footed Ferret	E/Ex
Notropis girardi	Arkansas River Shiner	T

* E = Federally listed as Endangered
T = Federally listed as Threatened
Ex = Extirpated

Table 3. Forest Service sensitive species potentially existing in the Canadian River Canyon

Scientific Name	Common Name
Charadrius montanus	Mountain Plover
Coccyzuss americanus	W. Yellow-billed cuckoo
Falco peregrinus anatum	Peregrine Falcon
Cynomys ludovicianus	Black-tailed Prairie Dog
Vulpes velox	Swift Fox
Phrynosoma cornutum	Texas Horned Lizard
Tympanuchus pallidicinctus	Lesser Prairie Chicken
Astragalus wittmani	One-flowered Milk Vetch
Lanus ludovicianus	Loggerhead Shrike
Hybopsis asetivalis tetranemus	Canadian Speckled Chub

The Canadian River provides habitat for several fish species. The river does not run year-round, at times becoming ephemeral with only a few pools along the river containing water. Surveys have been conducted over the years to determine which fish species exist in the river. The list in table 4 represents the results of Hoagstrom (1994) and a 2003 fish survey conducted by the University of New Mexico (Moyer, 2003).

The 2003 survey results did not duplicate those of the 1994 survey. The number of survey stations and locations collected along the Canadian River contributed to the different results in the number of species found in the two surveys.

The only exotic wildlife game species present within the project area are Barbary sheep. The New Mexico Department of Game and Fish introduced this species in the Canadian River drainage in the early 1950s. Once estimated to number in the hundreds, they now have dwindled to the point that they are rarely seen.

Table 4. Fish species known to exist in the Canadian River in the project area based on 1994 and 2003 surveys.

Scientific Name	Common Name
Cyprinella lutrensis	Red Shiner
Pimephales promelas	Flathead Minnow
Lepomis cyanellus	Green Sunfish
Ictalurus punctatus	Channel Catfish
Phenacobius mirabilis	Suckermouth Minnow*
Dorosoma cepedianum	Gizzard Shad*
Ameirus melas	Black Bullhead
Fundulus zebrinus	Plains Killifish
Micropterus salmoides	Largemouth Bass
Platygobio gracilis	Flathead Chub**
Notropis stramineas	Sand Shiner**
Rhinichthys cataractae	Longnose Dace**
Catostomus commersoni	White Sucker**
Campostoma anomalum	Central Stoneroller**

* Species not collected during 1994 Survey

** Species not collected during 2003 Survey

The "Cibola National Forest Land and Resource Management Plan" (1985) recognizes two management indicator species (MIS) present on the Kiowa National Grassland, the long-billed curlew and the grasshopper sparrow. These species represent the plains grassland habitat type. The objective of MIS was to select species for each major vegetation type that would serve as an indicator for detecting major habitat changes. The project area does not represent plains grassland habitat type, but instead consists of riparian and pinyon-juniper habitat with stringers of ponderosa pine in the adjacent drainages. Therefore, since tamarisk in the riparian channel will be the only habitat treated under this proposed project, MIS habitat will not be impacted.

Breeding bird surveys conducted within Mills Canyon since the early 1990s provide a list of the more common riparian-related species within and immediately adjacent to the riparian area along the Canadian River. Hart Schwarz, the forest's neotropical bird specialist, has been compiling these surveys for the Cibola National Forest in an annual breeding bird survey report. Based on this information, the list in table 5 constitutes the more common riparian breeding bird species found in the canyon bottom associated with the last four points of the Mills Canyon Breeding Bird Survey. This list is not all inclusive (Schwarz, 2005).

Large and small mammals use a variety of habitats found within the project area and adjacent habitats on the rim of the canyon. These include the cliffs, talus, uplands and riparian habitat. Known for its mule deer and barbary sheep populations, recent evidence of an increase in numbers of elk (cows and calfs) indicates they are also becoming established in the Canadian River drainage. Bear and mountain lion are common residents found within the project area.

Table 5. Riparian breeding birds in the Canadian River canyon and their relative abundance (based on 7 years of surveys)

Species	*Years Present	**Relative Abundance
Mallard	6x	2.57
Killdeer	4x	1.00
Mourning Dove	7x	17
Great Horned Owl	1x	.14
Black-chinned Hummingbird	6x	1.17
Belted Kingfisher	2x	.29
Hairy Woodpecker	3x	.43
Northern Flicker	3x	.86
Western Wood-Peewee	7x	5.00
Ash-throated Flycatcher	7x	6.14
Cassin's Kingbird	7x	8.57
Western Kingbird	7x	2.86
Western Scrub Jay	7x	3.43
Violet-green Swallow	7x	13.73
Bushtit	3x	6.57
White-breasted Nuthatch	7x	1.71
Bewick's Wren	7x	12.43
Blue-gray Gnatcatcher	5x	1.29
Western Bluebird	5x	1.43
American Robin	7x	4.57
Northern Mockingbird	7x	12.71
Yellow-breasted Chat	4x	1.14
Hepatic Tanager	6x	2.57
Spotted Towhee	7x	19.43
Canyon Towhee	6x	2.00
Chipping Sparrow	5x	1.71
Lark Sparrow	7x	8.86
Black-headed Grosbeak	7x	5.29
Blue Grosbeak	5x	2.29
Bullock's Oriole	7x	4.71
House Finch	7x	11.00
Lesser Goldfinch	7x	17.29

* Years Present: 7x means that the particular species was present during all 7 survey years.

** Relative Abundance: The mean for each survey year.

Environmental Consequences

The following analysis details the expected direct, indirect, and cumulative effects of the alternatives on threatened, endangered and sensitive (TES) and selected wildlife species including MIS and migratory birds. The Kiowa National Grassland in Harding and Mora Counties comprises the analysis area used to assess direct and indirect effects. A larger area encompasses the cumulative effects analysis. The cumulative effects area includes State, Federal, and private land surrounding the Kiowa National Grassland in Harding and Mora Counties in New Mexico. Over the next several years, tamarisk control treatment will and/or has occurred from the headwaters of the Canadian to the Texas and New Mexico border. The analysis considers these as potentially cumulative to the effects occurring on national grassland.

A neotropical migratory bird analysis of high priority species has been completed and is part of the project record.

Endangered, Threatened and Proposed Species

Introduction

The Forest Service completed a biological assessment and evaluation to determine the effects of the proposed action. The BA&E analyzed the effects/impacts of the proposal on threatened, endangered and sensitive species and their habitats. Biologists reviewed several wildlife or plant species lists to determine the species that may occur in the project area. These included:

- The U.S. Fish and Wildlife Service master list of threatened, endangered, proposed and candidate species for Harding and Mora Counties.
- The Regional Forester's Sensitive Species List.
- The New Mexico Department of Game and Fish 2002 list of species threatened and endangered in the state and their 2002 New Mexico species of concern status and distribution.
- New Mexico Energy, Minerals, and Natural Resources Department/Forestry and Natural Resources Conservation Division Inventory of Rare and Endangered Plants of New Mexico (August 1995).

Based on the best available information there are no known populations of threatened or endangered plants in the project area. Species other than those described in the following sections (including plants) were considered but not analyzed because they are not known to occur in the assessment area or in the habitat types that exist.

The biological assessment and evaluation made a determination of no effect to any threatened, endangered or proposed species or their habitats by implementing the proposed action and its associated activities on the Kiowa National Grassland, in Harding and Mora Counties in New Mexico. The following summarizes the key analysis in the BA&E.

Southwestern Willow Flycatcher

The southwestern willow flycatcher (SWWF) is considered a riparian obligate species. SWWF habitat consists of wide expanses of multilayer cottonwood and willow riparian areas that create wide corridors along banks of streams and rivers. The project would not affect the SWWF for three reasons: (1) the Canadian River on national grassland has a narrow riparian band that does not provide the dense riparian habitat that is required by the species; (2) since 1993, breeding bird

surveys eondueted by Sehwarz (2005) in Mills Canyon have not deteeted the presenee of the SWWF and; (3) **the Southwestern Willow Flycatcher Recovery Plan clearly illustrates this reach of the Canadian River on national grassland as being located outside of the Rio Grande Recovery Unit and "Outside of *Epidomax traillii* Range" (USFWS, 2002; SWWF Recovery Plan; Fig. 11 Rio Grande Recovery Unit).** Therefore, implementation of the proposed aetion and its assoeiated aetivities would have no direet, indireet, or eumulative effeets to the southwestern willow flyeateher or its habitat.

Black-footed Ferret

The blaek-footed ferret is regarded as one of the rarest mammals in North Ameriea and is listed as endangered under the Endangered Speeies Aet of 1973. The blaek-footed ferret is a noeturnal earnivore that is dependent on prairie dogs for both food and shelter. Blaek-footed ferrets use vaeated prairie dog burrows for shelter. Formerly ranging aeross the Great Plains and intermontane regions from southern Canada to northern Mexieo, the blaek-footed ferret historieally inhabited 12 western states ineluding New Mexieo. Blaek-tailed prairie dog towns provided the key habitat and prey eomponents for blaek-footed ferrets. Large eomplexes of blaek-tailed prairie dog towns in elose proximity are required in order to provide habitat and enough prey base to maintain a sustainable population of blaek-footed ferrets. Signifieant reduetions in the numbers and distribution of prairie dogs oeeurred throughout the last eentury due to poisoning, agrieultural eonversion, sylvatie plague, and introdueed diseases. Populations of blaek-footed ferrets, being highly dependent on prairie dogs, deelined dramatieally. Aeeording to the best information available, blaek-footed ferrets have been extirpated from Harding and Mora Counties. The last eonfirmed report of a blaek-footed ferret in New Mexieo was in 1934. The primary eauses of extirpation of the speeies from the state were habitat alteration and predator eontrol (BISON, 2004a).

No prairie dog towns or suitable habitat exists within the projeet area of the Canadian River drainage. Therefore, implementation of the proposed aetion and its assoeiated aetivities would have no direet, indireet, or eumulative effeets to the blaek-footed ferret, its prey base or its habitat.

Mexican Spotted Owl

The Mexiean spotted owl (MSO) inhabits eanyon and montane forest habitats aeross a range that extends from southern Utah and Colorado through Arizona, New Mexieo, and west Texas, to the mountains of eentral Mexieo. Spotted owls are eonsidered residents in the mountains of New Mexieo almost statewide, being most regular in the southern portion of the state. They ean be found in the San Juan, Jemez, Sangre de Cristo, Mt. Taylor, Sandia, Manzano, San Franeiseo, Tularosa, Mogollon, San Mateo, Pinos Altos, Blaek, White, Saeramento, Guadalupe, and Animas Mountains. Habitat eharaeteristies highly sought by Mexiean spotted owls inelude dense eanopy elosure, high stand density, a multilayered eanopy, uneven-aged stands, numerous snags, and downed woody material. These eonditions best exist in old-growth mixed-eonifer forests usually more than 200 years old.

The U.S. Fish and Wildlife Serviee listed the Mexiean spotted owl on Mareh 16, 1993. The nearest reeovery unit (RU) for the MSO is the Southern Roeky Mountains—New Mexieo Reeovery Unit, loeated west of the Canadian River. In this RU MSOs inhabit steep terrain and eanyons, typieally oeeurring in mixed-eonifer forests on steep slopes in the Sangre de Cristo Mountains, and in the Jemez Mountains where they oeeupy eanyons ineised into voleanie roek.

The MSO recovery plan illustrates this reach of the Canadian River on the Kiowa National Grassland as outside of the Southern Rocky Mountains—New Mexico Recovery Unit, and east of the owl's natural geographic range (USFWS, 1995; MSO Recovery Plan; Fig. II.A.1. Geographic Range of the Mexican Spotted Owl, Pg. 20; Fig. II.B.1. Recovery Unit within the United States, pg. 37). Therefore, implementation of the proposed action and its associated activities would have no direct, indirect or cumulative effects to the MSO or its habitat.

Bald Eagle

Bald eagles occur across the continent from northern Alaska to Newfoundland, and south to southern Florida and Baja California. They are often seen soaring or sitting on large snags along bluffs or shores. Information suggests that bald eagles prefer timbered areas along coasts, large lakes, and rivers, but will occupy other areas as well. During the winter, they will migrate and congregate in areas where food is more readily available such as near prairie dog towns (O'Gara, 1994).

The bald eagle is a rare winter visitor on the Kiowa National Grassland but on occasion individuals do occur during the seasonal migration. There are no nesting bald eagles within the Canadian River drainage on national grassland. Similar to other wintering raptors, eagles have been observed perched on telephone poles usually near a prairie dog town or feeding on a recent road kill. The presence or absence of bald eagles appears to be dependent on the severity of the winter to the north and will vary annually.

The proposed action and its associated activities are not expected to affect the bald eagle or its foraging or winter habitat quality, since implementation would occur in late summer (mechanical) and fall (aerial application in August and September). Salt cedar treatment under the proposed action would not target any of the large ponderosa pines and cottonwood galleries, which could provide potential roost and perch sites. Therefore, there would be no direct, indirect or cumulative effects to the bald eagle or its habitat from implementing the proposed action or its associated activities.

Arkansas River Shiner

The Arkansas River shiner is a small, heavy-bodied minnow with a rounded snout and small mouth. Its coloration tends to be sandy above and silver laterally, grading to white on the belly. Dorsal scales are typically outlined with dark pigment. The shiner feeds mostly on aquatic invertebrates. The shiner is native to wide, sandy-bottomed streams of the Arkansas River drainage in Arkansas, Kansas, New Mexico, Oklahoma, and Texas. Historically, it was abundant throughout these portions of the Arkansas River and its major tributaries. The shiner is presently almost entirely restricted to the Canadian/South Canadian River in Oklahoma, Texas, and New Mexico, a distance of about 508 river miles. A small, relict population is believed to remain in the upper Cimarron River in Kansas and Oklahoma (USFWS, 2005 Fact Sheet).

Surveys conducted by the University of New Mexico in 2005 in the Canadian River on the Kiowa NG did not detect Arkansas River shiner. Surveys in the Arkansas River Basin from 1976 to 2002 documented that the shiner disappeared from more than 80 percent of its historic range in the last 40 years. Habitat destruction and modification from stream dewatering or depletion due to diversion of surface water and ground water pumping, construction of impoundments, and water quality degradation threatens the species. However, management of invasive plant species such as

salt cedar can result in the conservation of streamflow and shiner habitat (USFWS, 2005 Fact Sheet).

Alternative 1: No Action

There would be no direct effects to the Arkansas River shiner or its habitat associated with the no action alternative. An indirect effect would be the increase, continued invasion, and creation of a monoculture of salt cedar throughout the Canadian River drainage. This might create an increase in ephemeral stretches of river that would limit habitat available to the Arkansas River shiner and other native fish and aquatic organisms.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar is known to use large quantities of water, this change would have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage. Dry stretches of the drainage equate to direct loss of existing and potential habitat for the Arkansas River shiner. This cumulative effect is probably greater along the stretch of the Canadian River above Ute and Conchas Reservoirs where water levels are not controlled by releases from an existing large water impoundment to counteract this negative effect.

Alternative 2: Proposed Action

There would be no direct effects associated with the proposed action alternative to the Arkansas River shiner or its habitat. Syracuse Environmental Research Associates, Inc., completed a risk assessment for human health and ecological risks associated with the use of imazapyr (SERA, 2004). The report summarized the herbicide's toxicity to fish species and described typical scenarios for imazapyr to enter water through overspray or runoff. At an application rate of 1 pound per acre (as planned in this proposal) the analysis showed that there would be no plausible basis for asserting adverse effects to nontarget aquatic species (SERA 2004, p. 4-28). The analysis included fish species considered tolerant to the herbicide and those that some research has shown to be sensitive to imazapyr. The amount of herbicide required to affect the tolerant fish species was from 1,250 to 50,000 times more than would be likely to enter the stream at the planned application rate. For species sensitive to the chemical, about 35 to 1,350 times more of the chemical would be required before an adverse effect would occur. The research studies referenced in the report assessed the effects on a variety of fish species (including sunfish and flathead minnow, identified as tolerant of imazapyr). Both the sunfish (family Centrarchidae) and the flathead minnow (family Cyprinidae) are good representative species of fish that have been found during surveys in the Canadian River drainage.

Indirect effects of potential Arkansas River shiner habitat can occur with mechanical treatment of isolated patches of salt cedar, during followup treatments with both heavy equipment and chain saw activity along the shoreline. Heavy equipment activity could contribute to sediment into the Canadian River, but actual amounts would be minimal and targeted to small areas. A positive indirect effect would be an increase over time in native trees and shrubs along the shoreline. It is difficult to determine what effect, if any, the defoliation of salt cedar would have on water temperatures within the river. Removal of the shading branches of salt cedar may increase solar radiation reaching the water's surface and could increase water temperature. Any temperature increase would diminish as native willows and cottonwoods begin to re-establish themselves and provide shade creating cooler temperatures and a change in this microclimate.

Cumulative Effects

Other agencies would implement salt cedar control treatments downstream from the Mills Canyon project over the next several years. Based on the low toxicity of the herbicide and the expected timing of future treatments it would be unlikely to have cumulative effects on the Arkansas River shiner. The Canadian River above Conchas Lake is an uncontrolled channel and natural flooding can occur annually, transporting and depositing sediment as a result. From a cumulative effects standpoint, the amount of sediment contributed from followup mechanical treatments in Mills Canyon and other mechanical treatments on other stretches of the river would be a minor component of the total sediment in the system.

Region 3 Sensitive Species

The biological assessment and evaluation (August 2006) determined that suitable habitat for many of the sensitive species does not exist within the proposed action area. Table 6 lists the sensitive species analyzed within the BA&E. Further detailed analysis on the majority of the species was not required since they were not detected during species surveys and/or there is no suitable habitat within the project area.

Table 6. Sensitive species analyzed within the BA&E

Species Name	No Suitable Habitat in Riparian Treatment Area	Species Not Detected During Surveys
Peregrine Falcon	X	X
Mountain Plover	X	X
Yellow-billed Cuckoo		X *
Loggerhead Shrike	X	
Black-tailed Prairie Dog	X	
Swift Fox	X	
Texas Horned Lizard	X	
Lesser-prairie Chicken	X	X
One-flowered Milk Vetch	X	X
Canadian Speckled Chub		X *

* This sensitive species is analyzed because its habitat is found within the Canadian River drainage.

Based on habitat requirements of the species and the lack of suitable habitat in the treatment areas, there would be no effects to peregrine falcon, mountain plover, loggerhead shrike, black-tailed prairie dog, swift fox, Texas horned lizard, lesser-prairie chicken, and one-flowered milk vetch. Although not detected during surveys in the area, habitat exists for the yellow-billed cuckoo and the Canadian speckled chub. The following section addresses effects on these species.

Yellow-billed Cuckoo

Yellow-billed cuckoos have undergone catastrophic declines in the west. Historically, yellow-billed cuckoos bred throughout most of continental North America, including portions of eastern and western Canada, northern and central Mexico. Wintering in South America, they are one of the latest neotropical migrants to arrive on their North American breeding grounds. Yellow-billed cuckoos prefer to nest in open woodlands with an understory of dense vegetation, especially near water. Young cuckoos will fledge in late July and early August (Wiggins, 2005). In New Mexico,

they are known to nest in riparian areas, preferably cottonwood galleries with an established willow understory.

During breeding bird surveys conducted on the grasslands, Schwarz (2002) detected three yellow-billed cuckoos in Perico Creek approximately 80 miles east of the project area. Apparently, the habitat feature preferred by the birds was the very dense shrubbery of sumac and wild grapes growing at the base of north-facing cliffs located along the immediate riparian zone in the Perico Creek drainage. This type of "riparian" habitat does not exist within the project area in the Canadian River. In addition, during breeding bird surveys conducted in Mills Canyon, from the early 1990s to 2002, yellow-billed cuckoos were not detected (Schwarz, 2005).

Alternative 1: No Action

There would be no direct effects associated with the no action alternative to any yellow-billed cuckoo. Since yellow-billed cuckoos nesting in riparian areas prefer cottonwood galleries with an established willow understory to nest, the increase and continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage would be an indirect effect related to loss of cuckoo habitat over time.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, from the headwaters to the Texas and New Mexico border, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Where yellow-billed cuckoo habitat exists along the Canadian River outside the project area, the potential exists to lose that habitat over time to salt cedar invasion.

Alternative 2: Proposed Action

There would be no direct effects to yellow-billed cuckoo from implementation of the proposed action since no cuckoos were detected during breeding bird surveys conducted from 1993-2002 (Schwarz, 2005). Indirect effects to cuckoo habitat may include temporary loss of cover habitat, and reduction in insect abundance until new vegetation becomes established in the understory, since aerial spraying will remove salt cedar foliage and only the skeletons will remain. These temporary losses will be offset in the future as native cottonwood galleries and willow stands become established since salt cedar does not support the same species richness, guilds, and population sizes as do native stands of cottonwood/willow.

Cumulative Effects

Salt cedar control would occur over the next 10 years or more from the headwaters of the Canadian River to the New Mexico/Texas state line. Approximately 200 miles of river would be treated during that time. There would be temporary loss of cover and foraging areas until the understory becomes re-established. The future establishment of native cottonwood galleries and willow stands would offset these temporary losses, providing an increase in suitable habitat for yellow-billed cuckoo over time. At the landscape level, cumulative effects due to loss of suitable nesting and foraging habitat in the short-term does not appear to be a threat on private lands surrounding public land.

Canadian Speckled Chub

In New Mexico, the Canadian speckled chub is now found only in the Canadian River downstream of Ute Reservoir. In this reach it remains moderately common. Historically the chub

was limited to the South Canadian River from near the confluence of Ute Creek downstream. This species inhabits low gradient, main channel streams, and the preferred substrates in these reaches are ones of fine gravel and sand. The speckled chub is one of the most characteristic small fishes inhabiting shallow rivers and streams with swift turbidity and dissolved solids. It prefers more turbid water and avoids clear headwater areas. The nearest populations of Canadian speckled chub are found west of the project area on the Pecos River downstream of Anton Chico (BISON, 2004b).

The Canadian speckled chub has disappeared from about 75 percent of its historic range. Surveys conducted on the stretch of the Canadian River on the Kiowa NG by the University of New Mexico in 2005 did not detect Canadian speckled chub. Like the Arkansas River shiner, habitat destruction and modification from stream dewatering or depletion due to diversion of surface water and ground water pumping, construction of impoundments, and water quality degradation threatens the chub. However, management of invasive plant species such as salt cedar can result in the conservation of streamflow and shiner habitat.

Alternative 1: No Action

There would be no direct effects to this species from implementing the no action alternative. An indirect effect would be the increase and continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage, which might create an increase in ephemeral stretches of river. As these changes occur, a reduction in the amount of habitat available to Canadian speckled chub and other native fish and aquatic organisms is likely.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar is known to absorb large quantities of water, this change would have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage. Dry stretches of the drainage equate to direct loss of potential and suitable habitat for the Canadian speckled chub. This cumulative effect is probably greater along the stretch of the Canadian River above Ute and Conchas Reservoirs where water levels are not controlled by releases from an existing large water impoundment to counteract this negative effect.

Alternative 2: Proposed Action

There would be no direct effects associated with the proposed action alternative to the Canadian speckled chub or its habitat. As described in the effects discussion for the Arkansas River shiner, the formulation of imazapyr used to control salt cedar would have no effect on aquatic species due to its low toxicity and low application rate. Indirect effects of potential Canadian speckled chub habitat can occur with mechanical treatment of isolated patches of salt cedar, during followup treatments with both heavy equipment and chain saw activity along the shoreline. Heavy equipment activity could temporarily contribute to sediment into the Canadian River, but actual amounts would be minimal and targeted to small areas. A positive indirect effect over time would be an increase in native trees and shrubs along the shoreline. At this point it is difficult to determine what effect, if any, the salt cedar skeletons will have on an increase in water temperatures within the microclimate once provided by shading branches of salt cedar. This will diminish as native willows and cottonwoods begin to re-establish themselves and provide shade creating cooler temperatures and a change in this microclimate.

Cumulative Effects

Additional aerial spraying of salt cedar would likely occur on the Canadian River above and below the Mills Canyon section. These treatments would be unlikely to affect the species due to the low toxicity of imazapyr and its rapid degradation in water. From a cumulative effects standpoint, considering the Canadian River above Conchas Lake is an uncontrolled channel and natural flooding can occur annually, the amount of sediment contributed into the river from followup mechanical treatments would be minor.

Treatment of salt cedar will provide an opportunity to move toward recovering the ecological balance of native vegetation within the Canadian River drainage in which Canadian speckled chub as well as many other aquatic organisms evolved. Therefore, implementation of the proposed action and its associated activities will outweigh any direct, indirect or cumulative effects to the Canadian speckled chub or its habitat.

State of New Mexico Listed Species

The biological assessment and evaluation determined that suitable habitat for many of the sensitive species does not exist within the proposed action area. Table 7 lists the New Mexico threatened and endangered species analyzed within the BA&E. No further detailed analysis was required for some species since they were not detected during species surveys and/or no suitable habitat exists within the project area.

Table 7. New Mexico threatened and endangered species analyzed within the BA&E

Species Name	Suitable Habitat in Riparian Treatment Area	Species Detected During Surveys
Southern Redbelly Dace	No: the redbelly dace is not found in the Canadian River.	No
Paper Pondshell	Yes	No
Suckermouth Minnow	Yes	Yes
Arid Land Ribbon Snake	Yes	Yes
Baird's Sparrow	No: Baird's sparrow is a grassland species.	No
American Marten	No: the marten is a mountain species.	

Paper Pondshell

The paper pondshell is a freshwater mussel and is a New Mexico state listed endangered species. Surveys detected the paper pondshell in the Canadian River drainage on Ute Creek and Conchas Lake. It inhabits a variety of substrates, but prefers soft bottoms in backwater areas. It may inhabit soft, silty bottoms in which other heavier-shelled unionids would sink and smother. This fast-growing, relatively short-lived species is often very abundant in farm pond environments. Paper pondshell is widely distributed and often extremely abundant in favorable environments. Rapid growth, apparent ability to complete its life cycle without a host, and preference for soft bottom environments may give this species a survival advantage over other slow-growing, bivalve species (Lang and Mehlhop 1996).

Although this species does not occur within the reach of the Canadian River drainage on Kiowa National Grassland, suitable habitat of soft, silty, muddy bottoms does exist within the proposed treatment area.

Alternative 1: No Action

There would be no direct effects to the paper pondshell under the no action alternative. An indirect effect would be the continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage that might create an increase in ephemeral stretches of river, making habitat unavailable to the paper pondshell or other aquatic organisms.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar is known to absorb large quantities of water, this change would have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage. Dry stretches of the drainage equate to direct loss of potential and suitable habitat for the paper pondshell. This cumulative effect is probably greater along the stretch of the Canadian River above Ute and Conchas Reservoirs where water levels are not controlled by releases from an existing large water impoundment to counteract this negative effect. But since the paper pondshell was detected at Conchas and Ute, the demand for water for agricultural and urban development will continue to affect the water levels and availability of paper pondshell habitat.

Alternative 2: Proposed Action

There would be no direct effects to the paper pondshell by implementing the proposed action and its associated activities. Indirect effects would be minimal since the chemical herbicide imazapyr appears to have a very low potential to cause any adverse effects in aquatic species. A positive indirect effect over time will be the re-establishment of native vegetation and the creation of backwater ponds which would provide potential suitable habitat for the paper pondshell. The ecological risks of imazapyr in mollusks showed no bioconcentration and no effect in the growth of the oyster shell and, therefore, it is expected to be the same for mussels like the paper pondshell (SERA, 2004).

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would not continue to proliferate, and re-establishment of native trees, shrubs and shoreline vegetation would occur over time. Because salt cedar is known to use large quantities of water, this change would have a positive effect on water availability and decrease the existing seasonal ephemeral conditions throughout the Canadian River drainage. This cumulative effect would be more noticeable along the stretch of the Canadian River above Ute and Conchas Reservoirs where water levels are not controlled by releases from an existing large water impoundment. It will be difficult to determine how the continued demand of water for agricultural and urban development will continue to affect the water levels and availability of paper pondshell habitat.

Suckermouth Minnow

In New Mexico the suekermouth minnow is found in the Dry Cimarron River, the Canadian River drainage (Cimarron to Conchas Lake), and in the upper Pecos River from Sumner Lake to Fort Sumner. All of these constitute key habitat areas, although possibly the ocurrences in the Pecos River are not natural. This species is believed to have been more common within its native range in the state prior to the 1870s. The distribution since then has been reduced to localized populations, probably as a result of depleted surface waters stemming directly from irrigation activities and overgrazing. Available records indicate the suckermouth minnow is uncommon.

Surveys of the Mills Canyon reach of the Canadian River in 1994 and 1995 failed to collect the species (BISON, 2004c). Surveys conducted by the New Mexico Museum of Southwestern Biology (2005) in the Mills Canyon reach did collect the suckermouth minnow. In New Mexico, the native range now includes only the South Canadian and Dry Cimarron Rivers. The species there has a discontinuous distribution and is generally rare.

The species inhabits mainly sand, gravel, and rubble-bottomed riffles in small to moderate-sized streams. Although generally associated with clear waters in some areas, this minnow appears to be tolerant of high levels of turbidity. This species inhabits riffles in small to moderate-sized clear water streams with substrates ranging from sand and gravel to large boulders. The suckermouth minnow is a bottom feeder, feeding mainly on the immature stages of aquatic insects that it finds among the gravel and rubble.

Alternative 1: No Action

There would be no direct effects associated with the no action alternative to the suckermouth minnow. An indirect effect would be the increase and continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage. This might create an increase in ephemeral stretches of river that would decrease habitat available to suckermouth minnow or other aquatic organisms.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar uses large quantities of water, this change would have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage that already exist. Dry stretches of the drainage equate to direct loss of potential and suitable habitat for the suckermouth minnow. This cumulative effect is probably greater along the stretch of the Canadian River above Ute and Conchas Reservoirs where releases from an existing large water impoundment do not control water levels.

Alternative 2: Proposed Action

There would be no direct impacts associated with the proposed action alternative to the suckermouth minnow or its habitat. As described in the effects discussions for the Arkansas River shiner and Canadian speckled chub, the formulation of imazapyr used to control salt cedar would have no effect on aquatic species due to its low toxicity and low application rate. Representative species of the cyprinid family (suckermouth minnow) were tolerant of the herbicide. The amount of herbicide entering the river would be from 0.002 to 0.08 percent of what would be required to affect the species. Indirect effects to potential suckermouth minnow habitat can occur with mechanical treatment of isolated patches of salt cedar, and during followup treatments with both heavy equipment and chain saw activity along the shoreline. Heavy equipment activity could contribute to sediment into the Canadian River, but actual amounts would be minimal and targeted to small areas. A positive indirect effect over time would be an increase in native trees and shrubs along the shoreline. At this point it is difficult to determine what effect, if any, the salt cedar skeletons will have on an increase in water temperatures within the microclimate once provided by shading branches of salt cedar. This will diminish as native willows and cottonwoods begin to become re-established and provide shade creating cooler temperatures and a change in this microclimate.

Cumulative Effects

Additional aerial spraying of salt cedar would likely occur on the Canadian River above and below the Mills Canyon section. These treatments would be unlikely to affect the species due to the low toxicity of imazapyr and its rapid degradation in water. From a cumulative effects standpoint, considering the Canadian River above Conchas Lake is an uncontrolled channel and natural flooding can occur annually, the amount of sediment contributed into the river from followup mechanical treatments becomes a non-significant issue.

Treatment of salt cedar will provide an opportunity to move toward recovering the ecological balance of native vegetation within the Canadian River drainage in which suckermouth minnow as well as many other aquatic organisms evolved. Therefore, implementation of the proposed action and its associated activities will outweigh any direct, indirect or cumulative effects to the suckermouth minnow or its habitat.

Arid Land Ribbon Snake

Populations of ribbon snake persist in New Mexico only as an isolated relict of large populations in the eastern United States where the species is often very abundant. This species is rarely found away from permanent water sources and requires a specific habitat type and quiet water where numerous small fishes, tadpoles and small frogs persist. Aquatic habitat may include stock tanks, small tributary streams, rivers, marshes, or irrigation ditches. Very little is known about the food habits of ribbon snakes in the arid western states, however, the snake likely feeds predominately on fish, tadpoles, and small frogs in New Mexico (Painter and Wilds, 2000).

Alternative 1: No Action

There would be no direct effects associated with the no action alternative to the arid land ribbon snake, but an indirect effect would be the increase and continued invasion and creation of a monoculture of salt cedar throughout the Canadian River drainage. If ephemeral reaches of the Canadian River were to increase, loss of prey base habitat would occur because the ribbon snake hunts along the river and is presumed to feed on small fish, tadpoles and amphibians found in the Canadian River drainage.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar is known to absorb large quantities of water, this change would be expected to have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage for longer periods.

Alternative 2: Proposed Action

There would be no direct effects to the ribbon snake from aerial spraying of imazapyr since they are found in limited numbers throughout the project area and most likely will be hidden in the understory when spraying occurs. If a ribbon snake is sprayed during aerial treatment, the weight of evidence suggests that no adverse effects in terrestrial vertebrates are likely using typical or worst-case exposure assumptions at the typical application rate of 1 lb/acre (SERA 2004). The ribbon snake probably does not make use of salt cedar except as escape cover from potential predators. A positive indirect effect over time would be an increase in native trees and shrubs along the shoreline. At this point it is difficult to determine what effect if any the salt cedar

skeletons will have by an increase in the temperatures of the water within the microclimate once provided by shading branches of salt cedar on the ribbon snakes preybase. This will diminish as native willows and cottonwoods begin to become re-established and provide shade creating cooler temperatures and a change in this shoreline microclimate.

Cumulative Effects

At the landscape level, looking beyond the confines of public land, salt cedar would continue to proliferate and out-compete native trees, shrubs and shoreline vegetation. Because salt cedar uses large quantities of water, this change would have an impact on seasonal water availability and create an increase in ephemeral conditions throughout the Canadian River drainage. Dry stretches of the drainage equate to direct loss of preybase habitat. This cumulative effect is probably greater along the stretch of the Canadian River above Ute and Conchas Reservoirs where water levels are not controlled by releases from an existing large water impoundment to counteract this negative effect.

Management Indicator Species

The "Cibola National Forest Land and Resource Management Plan" identified management indicator species (MIS) to estimate the effects that planned activities may have on wildlife populations. The management indicator species for the Kiowa National Grassland are the long-billed curlew and the grasshopper sparrow. The Cibola LRMP EIS (1985) estimated plains grassland habitat occurrence on about 29 percent of the forest. Current mapping indicates there are 252,124 acres of this habitat type on the grasslands of which 232,828 are on the Kiowa and Rita Blanca National Grassland. The trend for this habitat type is stable on the national grasslands.

Management indicator species were selected to simplify the evaluation of impacts on terrestrial vertebrate species with different habitat requirements. These species indicate the effects of resource management on the habitats of all wildlife (USDA FS 1985, as amended). The management indicator species report prepared for this project provides a complete description of each indicator species and its habitat needs. It would also describe in detail the effects for each MIS habitat type and populations as a result of implementing the project. The MIS report is in the project record. The report incorporates information from the forest-level MIS report (Cosper and deGruyter, 2005).

Long-Billed Curlew

Long-billed curlews nest in shortgrass and mixed-grass prairie, with or without scattered shrubs, and occasionally in idle cropland such as wheat stubble. Curlews are often found within one-quarter mile of standing water, and often much closer, although the birds are rarely seen actually using the water. They prefer short vegetation, and nest where vegetation is less than 12″ and often where it is less than 4″ tall. Long-billed curlews are one of the highest conservation priorities on the Great Plains. Their populations in the shortgrass prairie have declined 10 percent per year for several decades (RMBO, 2001). Breeding bird surveys conducted by Schwarz (2005) between 1993 and 2002 in the Canadian River drainage have not detected long-billed curlew.

Grasshopper Sparrow

Grasshopper sparrows are found in most types of grassland, usually in tallgrass and mixed-grass prairies, but also shortgrass, especially where scattered shrubs, trees, or other tall plants are present. Like several other grassland bird species, grasshopper sparrow populations are declining

wherever they are found. Causes include loss of habitat by urbanization, conversion of native grassland to cropland, and overgrazing (RMBO, 2001). Breeding bird surveys conducted by Schwarz (2005) between 1993 and 2002 in the Canadian River drainage have not detected grasshopper sparrow.

Effects Common to All Alternatives

Under either the no action or proposed action alternatives, long-billed curlew and grasshopper sparrow habitat quality would not be impacted. The project area consists mostly of canyon habitat in ponderosa pine, pinyon/juniper, flood plain and riparian habitat along the Canadian River, and is not located in suitable grassland habitat utilized by either of the MIS species. Therefore, there will be no direct, indirect, or cumulative impacts to these MIS by implementing the proposed action or no action alternatives. There will be no change in population trend, nor any net loss or temporary impact of MIS habitat from implementing this proposed project for either the long-billed curlew or the grasshopper sparrow. From a landscape approach, the most significant cumulative effect to both MIS within the surrounding landscape of the Kiowa National Grassland ecosystem is the impacts of habitat loss through fragmentation, cultivation, urbanization and heavy grazing on surrounding private lands.

Other Selected Species

Golden Eagle

During the spring of 2005, a nesting pair of golden eagles was discovered on a ledge close to the bottom of the drainage, within one-quarter mile of the existing Mills Canyon Campground along the Canadian River. It is unusual to find golden eagles nesting so close to the bottom of a canyon, especially since they are considered very sensitive to disturbance. Golden eagles are not federally listed, but both the bald and golden eagle and their nest sites are protected by the Federal Bald Eagle Protection Act. The definition of take includes molest or disturb. Therefore, any project activities that could disturb or change the behavior of the nesting golden eagles would be considered as potential "take" under the Bald Eagle Protection Act and will be mitigated with a seasonal restriction for nesting golden eagles.

Alternative 1: No Action

There would be no direct effect to nesting golden eagles under the no action alternative since they are not a riparian obligate and the continued increase in salt cedar infestation would not completely eliminate roosting habitat in the Canadian River drainage. Roosting or perching habitat directly linked to riparian would include large cottonwood galleries now present in the Canadian River system. Indirect effects over time would be associated with the loss of large roosting or perching trees in the immediate riparian zone due to increased salt cedar infestation. These effects would be partial since large diameter ponderosa pines and pinyon pines located along the side drainages would remain to provide roosting and perching trees.

Cumulative Effects

There should be no additional cumulative effects under the no action alternative. At the landscape level cumulative effects due to loss of suitable nesting and foraging habitat does not appear to be a threat on private lands surrounding public land. Some perching and roosting habitat would be lost over time as large native riparian trees are lost and no longer available and regeneration is hindered throughout the Canadian River drainage.

Alternative 2: Proposed Action

Fortunately, the most effective time to treat salt cedar is in the late summer, during the months of August and September and a seasonal treatment restriction will assure the nesting birds will not be disturbed and still be within the window of salt cedar treatment. Positive indirect effects would result over time from implementing the proposed action by treating salt cedar and promoting natural regeneration of native riparian trees such as cottonwoods and large willows, which assures replacement perch and roost habitat for golden eagles and other raptors within the Canadian River drainage.

Cumulative Effects

With a seasonal restriction in place for nesting golden eagles, there would be no direct effects associated with aerial application and treatment of salt cedar to the nesting pair. The landscape level cumulative effects due to loss of suitable nesting and foraging golden eagle habitat, does not appear to be a threat on private lands surrounding public land over the life of the project throughout the Canadian River drainage.

Migratory Birds

A neotropical migratory bird analysis has been completed for this project and is part of the project record. On January 10, 2001, the President signed Executive Order 13186 placing emphasis on conservation of migratory birds. No Forest Service regional or forest-level policies have been developed to provide guidance on how to incorporate migratory birds into NEPA analysis. The Southwestern Regional Office advises to analyze effects in the following manner:

1. Effects to highest priority birds listed by Partners in Flight.
2. Effects to important bird areas (IBAs).
3. Effects to important over-wintering areas .

The project area is located within Conservation Region 18, Shortgrass Prairie, which includes all of the Kiowa/Rita Blanca National Grasslands. The high priority species for Region 18 on the Cibola NF include: ferruginous hawk, Swainson's hawk, scaled quail, mountain plover, American avocet, long-billed curlew, Wilson's phalarope, burrowing owl, black-chinned hummingbird, broad-tailed hummingbird, Lewis's woodpecker, loggerhead shrike, pinyon jay, Virginia's warbler, Cassin's sparrow, black-chinned sparrow, vesper sparrow, dickcissel and eastern meadowlark.

Of these high priority species listed above for Region 18 on the Kiowa National Grassland, long-billed curlew, black-chinned hummingbird, broad-tailed hummingbird, Lewis's woodpecker, loggerhead shrike, pinyon jay, Virginia's warbler, Cassin's sparrow, and black-chinned sparrow were detected during breeding bird surveys conducted by Schwarz (2005) from 1993-2002. With the exception of Lewis's woodpecker, none of these high priority species are considered common in riparian areas and use other habitats within the canyon (See "Wildlife Affected Environment"). Lewis's woodpecker will create cavities in dead branches of mature cottonwood trees for nesting, but cottonwood is not targeted for treatment or removal and, therefore, Lewis's woodpecker habitat will not be impacted by implementation of the proposed action or its associated activities. The loggerhead shrike is a shrub grassland species and the mountain plover is basically a bird of the shortgrass prairie, and do not occur in riparian habitat.

Table 8 lists the bird species that are common in the Canadian River riparian reach of the Kiowa National Grassland. This list is based on the last four points of the Mills Canyon breeding bird surveys (1993-2002) which are located near and within the riparian corridor. Although not all are migrants, the table below represents a realistic guild of neotropical, resident and short-distance migrant nesting birds associated with the existing Canadian River riparian habitat proposed for treatment under the proposed action. The neotropical migrants are identified in bold.

Table 8. Neotropical, resident, and short-distance migrant nesting birds associated with Canadian River riparian habitat.

Species Name	*Years Present	**Relative Abundance
Mallard	6x	2.57
Killdeer	4x	1.00
Mourning Dove	7x	17
Great Horned Owl	1x	.14
Black-chinned Hummingbird	6x	1.17
Belted Kingfisher	2x	.29
Hairy Woodpecker	3x	.43
Northern Flicker	3x	.86
Western Wood-Peewee	7x	5.00
Ash-throated Flycatcher	7x	6.14
Cassin's Kingbird	7x	8.57
Western Kingbird	7x	2.86
Western Scrub Jay	7x	3.43
Violet-green Swallow	7x	13.73
Bushtit	3x	6.57
White-breasted Nuthatch	7x	1.71
Bewick's Wren	7x	12.43
Blue-gray Gnatcatcher	5x	1.29
Western Bluebird	5x	1.43
American Robin	7x	4.57
Northern Mockingbird	7x	12.71
Yellow-breasted Chat	4x	1.14
Hepatic Tanager	6x	2.57
Spotted Towhee	7x	19.43
Canyon Towhee	6x	2.00
Chipping Sparrow	5x	1.71
Lark Sparrow	7x	8.86
Black-headed Grosbeak	7x	5.29
Blue Grosbeak	5x	2.29
Bullock's Oriole	7x	4.71
House Finch	7x	11.00
Lesser Goldfinch	7x	17.29

* Years Present: 7x means that the particular species was present during all 7 survey years.

** Relative Abundance: The mean for each survey year.

Two important bird areas have been established on the Kiowa, one at Perico Creek approximately 80 miles east of the proposed project area, and the other at Sauz Creek located approximately 8 miles east of the Canadian River drainage. IBAs were established by the National Audobon Society for their rich species diversity and unique habitats that birds depend on for their survival. The proposed project and its associated activities will not impact the IBAs since both are located outside of the proposed project area.

Over-wintering or wintering birds on the grasslands are influenced by the severity and frequency of winter storms to the area. The Canadian River drainage is an important migration corridor during fall and spring for neotropical bird species. Raptor species are the dominant wintering birds on the grasslands, and some use ponderosa pine and large cottonwoods like those found in the Canadian River drainage to roost in. Typically, wintering raptors are commonly seen foraging in black-tailed prairie dog towns located outside of the project area. Therefore, the proposed project and its associated activities will not impact wintering birds or their habitat, since the proposed treatment will not occur in the winter and native trees such as ponderosa pine and cottonwoods will not be impacted.

Alternative 1: No Action

There would be no direct effects to neotropical migratory bird species under the no action alternative. The greatest impact to native bird species over time would be due to the indirect effects of habitat changes. The increased loss of natural cottonwood galleries and willow riparian stand components in all age classes will continue with the expansion of salt cedar in the proposed project area. Salt cedar does not allow the natural regeneration of native vegetation to occur by directly out-competing seedlings and increasing salinity contents in the soil through shed leaves.

Research (Johnson, et al. 2005) has shown that bird diversity in salt cedar is much less than in a native cottonwood stand with a well developed willow understory. Salt cedar creates channelization of the riverbanks when well established. There is no understory vegetation in a monoculture of salt cedar, which is reflected in the lack of berry and seed producing shrubs and plants, or insect diversity extremely important to nesting and migrating birds.

Cumulative Effects

Habitat losses would be compounded throughout the Canadian River system. Downstream salt cedar control would be ineffective because large seed sources would remain on public land in Mills Canyon. These would provide seed for re-infestation of downstream areas, likely prolonging loss of habitat.

Alternative 2: Proposed Action

Many bird species migrate through the Canadian River riparian corridor during the fall on their annual trek south. Aerial spraying would occur during the months of August and September. We anticipate that neotropical bird species (both adults and fledged and early migrants) are the ones most likely to be directly impacted by aerial spraying. There is a small chance that some may be directly sprayed. However, according to SERA (2004), birds given oral administration showed no mortality and no abnormal behavioral reactions or systematic signs of toxicity. Therefore, birds ingesting the herbicide formulation during preening would not be affected. Insects that are prey base for some bird species may also be directly sprayed. Based on the imazapyr application rate, small birds consuming contaminated insects may receive a dose of 3.76 mg/kg/event. This

exposure is below the toxicity value of 674 mg/kg/event (the No Observable Effects Level (NOEL)). Therefore, there would be no adverse effects to highest priority bird species.

Waterfowl (e.g. mallards or early migrating teal) may consume aquatic vegetation that has been directly sprayed. Based on the imazapyr application rate, waterfowl consuming contaminated aquatic vegetation may receive a dose of 2.69 mg/kg/event, which is below the NOEL of 674 mg/kg/event. Therefore, there would be no adverse effects to waterfowl.

The seasonal restrictions placed on aerial spraying to prevent disturbance to the golden eagle would also benefit nesting neotropical migrants. After aerial application, indirect effects may include displacement of nest sites, temporary loss of habitat, and reduction in insect abundance until new vegetation becomes established in the understory. The aerial spraying will remove salt cedar foliage and only the salt cedar skeleton will remain. Birds previously utilizing salt cedar for nesting may be displaced and forced to nest in areas adjacent to the riparian zone. This may result in increased competition in the remaining cottonwood or willow galleries. Neotropical bird species will forage within the salt cedar, even though there is a lower diversity of insects found in salt cedar compared to native vegetation. Removing salt cedar would temporarily remove this foraging habitat.

Ute Creek is an example of what to expect after application. A site visit was conducted at Ute Creek (Summer 2005) 3 years after spraying imazapyr to control salt cedar. New growth of a diverse, lush understory was noticeable among the salt cedar skeletons. The understory contained numerous insects and bird life was abundant. Birds observed during the site visit include the following species: oriole, mockingbird, western kingbird, mourning dove, blue grosbeak, and hummingbird species. Both adults and fledged young were observed.

Proposed salt cedar treatment will not occur during the winter and will not treat ponderosa pine or cottonwoods which may be used by wintering raptors. Therefore, implementing the proposed project and its associated activities will not impact winter roosting habitat or wintering birds.

Cumulative Effects

Salt cedar control would occur over the next 10 years from the headwaters of the Canadian River to the New Mexico/Texas state line. Approximately 200 miles of river would be treated during that time. Some nesting habitat will be lost for those species that use salt cedar. There would be temporary loss of cover and foraging areas until the understory becomes established. These temporary losses would be offset in the future as native cottonwood galleries and willow stands become established. A benefit of the proposed action alternative is native species such as cottonwood and willow support greater species richness and support larger population sizes than does a monoculture of salt cedar.

At the landscape level, cumulative effects due to loss of suitable nesting and foraging habitat in the near future does not appear to be a threat on private lands surrounding public land.

Recreation and Scenic Resources

Affected Environment

Recreation

The grassland ownership in Mills Canyon is in large contiguous parcels along the Canadian River rather than the fragmented pattern typical of other parts of the grasslands. The Federal Government purchased the Kiowa section of Mills Canyon beginning in 1934, as part of the Mills Land Utilization Project (LUP). The Bankhead-Jones Act in 1937 secured the Mills LUP's future, and the Soil Conservation Service (SCS) started to manage the area. In the late 1930s, the SCS hired Works Progress Administration (WPA) work crews to implement restoration projects and to improve the road into Mills Canyon. By 1940, the WPA-constructed picnic area had become a popular recreation spot. The SCS transferred administration of the Mills LUP lands to the Forest Service in 1953. In 1960 the LUPs were renamed national grasslands. The Forest Service constructed the existing Mills Canyon Campground in 1959. In 1965 the Canadian River flooded, which required major restoration to reopen the site.

Due to its ownership pattern, history, and physical characteristics, Mills Canyon supports the most diverse recreation opportunities on the Kiowa and Rita Blanca National Grasslands. Weekends in the summer and fall receive the highest recreation use, especially during hunting seasons. Deer hunting is popular in late fall and there is a wild turkey hunting season in the spring. During summer months, the public uses the area for bird watching, hiking, horseback riding, and fishing. Motorized use includes ATV and motorcycle riding.

Mills Canyon Campground, the only overnight recreation facility on the Kiowa and Rita Blanca NGs, lies within the project area. The campground often fills completely on the weekends during summer and fall hunting seasons. This campground is scheduled for reconstruction fall 2006, or during the spring or summer season 2007. When completed, it will provide 12 individual family sites, designed to accommodate 70 people at one time. Dispersed camping in undeveloped areas is also popular, including the areas where tamarisk is prevalent. The river is likely a major attraction for visitors to the canyon. Perennial rivers in New Mexico are relatively rare and attract recreation visitors where they occur.

Tamarisk does not directly contribute or detract from the recreation opportunities in the canyon. Neotropical migratory birds use the tamarisk, which then provides some bird watching opportunities, as do the native species in the canyon such as willows and cottonwoods. The tamarisk tends to form dense thickets that make it difficult to move through to access the river's edge for fishing and other recreation opportunities. Near the campground, a thicket of tamarisk has trapped debris and sediment from the river's flow. A berm has formed from the debris and sediment, reducing the connection between the river and the campground.

Scenic Resources

The landscape character of Mills Canyon is unique for the area. Gently rolling grasslands with patches of pinyon-juniper border the canyon. Nearing the canyon rim, the pinyon and juniper becomes more continuous. The canyon provides a major contrast to the grasslands along the rim. The 800-foot drop to the valley bottom reveals red cliffs of sandstone and shale that form the canyon walls. Ponderosa pines grow in the upper elevations of the canyon walls. The Canadian River flows along the bottom, with clumps of willows and tamarisk and pockets of cottonwoods growing along the banks. While the rim has few deciduous trees or shrubs, the canyon features

cottonwoods and other trees and shrubs that provide splashes of fall color. The vegetation along the riparian zone of the river is an important visual element in the canyon, contrasting with the red rock of the canyon walls, and the more muted greens and golds of the upland vegetation. Tamarisk is a visual component of the riparian area, especially pronounced in the fall.

Tamarisk was originally introduced to North America to use as an ornamental plant (National Invasive Species Council, 2006). Since it has ornamental qualities, tamarisk does provide a positive contribution to scenic quality. This is more pronounced in the fall, when they display golden colors of the changing leaves.

The ruins of the Mill's orchard and ranch operation add character to the canyon near the campground. The remains of the beautifully crafted stone structures give a sense of mystery and connection to the past. A few remnant fruit trees and Osage orange trees still survive in the canyon.

The Visual Management System used to assess scenic quality and assign management objectives classifies Mills Canyon as Variety Class A – Distinctive (USDA FS 2006). This classification refers to areas where features of landform, vegetative patterns, water, and rock formations are of unusual or outstanding visual quality. Forest Road K600 and the campground are assigned a Sensitivity Level 2. Sensitivity levels relative measure concern that people have for the scenic quality of an area. This classification defines routes that are secondary in the transportation system or secondary smaller scale recreation sites.

The forest plan assigned a Visual Quality Objective (VQO) of Partial Retention for the canyon based on the Visual Management System process (USDA FS 2006.) To meet Partial Retention, management activities may be evident, but adopt the form, line, color and texture of the characteristic landscape so they do not dominate the view.

Other Recreation and Scenic Resources Considerations

Wild and Scenic River Eligibility. The Canadian River Canyon (including Mills Canyon) has been identified as eligible for wild and scenic river status. The forest plan directs management of the canyon to preserve its wild, scenic or recreation river potential. Criteria in the Wild and Scenic Rivers Act (PL 90-542.) determine the river's eligibility. To be eligible a river must be free flowing and must possess one or more "outstandingly remarkable values": scenic, recreational, geological, fish and wildlife, historical, cultural and/or other values, including ecological.

This segment of the Canadian River was determined to be eligible based on its scenic, recreational, geological, and historical values. In addition to the recreation and historical opportunities, the canyon is also noted for its natural beauty and the fall color display that is unique in this region. The river is eligible for its scenic characteristics (USFS 2002).

Roadless Character. Mills Canyon has been included in the roadless inventory for the Cibola National Forest. The roadless inventory includes only the Forest Service administered portion of the river canyon within the middle 9 to 10 miles of Mills Canyon below the rim, with the exception of Forest Road K600, the campground and approximately a 300-foot buffer to either side of these roads. The only roads to receive routine maintenance in the canyon are Forest Road K600 and the campground road and parking areas. As part of forest plan revision for the Kiowa National Grassland, the Cibola is preparing a wilderness evaluation report for the Canadian River Inventoried Roadless Area (IRA).

Environmental Consequences

Recreation

Alternative 1: No Action

There would be limited direct effects from the no action alternative. Tamarisk would continue to be a dominant species in the riparian area. Where tamarisk thickets dominate, they would reduce recreation access to the river. This alternative would have no impacts on the potential for solitude. There would be an impact to bird watchers, where loss of native habitat changes the composition of the bird species.

The increase in tamarisk would reduce connection to the river. While trails have developed from the campground, it is difficult to reach the river, with only a few access points on the sediment berm that has developed under the tamarisk. Increases in the amount and density of tamarisk would further reduce river access over time.

Cumulative Effects—Because there would be no action taken, cumulative effects to recreation would not occur.

Alternative 2: Proposed Action

The initial effect would be the closure of Mills Canyon during tamarisk spray activities. The canyon would be closed to recreation during aerial spraying operations and 1 day following treatments. This closure is expected to be 2 or 3 days, but could be longer depending on weather and flying conditions. Tables in the campground will be washed following the spraying, to minimize the potential for herbicide exposure to visitors. There will be additional intrusion from noise and people when using chain saws to cut the tamarisk, the application of the herbicide with backpack sprayers, and vehicles used to transport workers. Since this canyon is remote and not intensively used, this activity may reduce the quality of the experience for visitors who desire solitude. The activities associated with the proposed action may also change hunting patterns. The additional people using chain saws or backpack sprayers may influence where hunters choose to hunt if the timing is in conflict. Impacts from proposed action activities would be intermittent over the treatment period. The "Human Health and Safety" section of this EIS addresses anticipated effects on visitor safety.

The presence of dead tamarisk stems is not expected to change recreation use. As the tamarisk component is reduced through cutting or natural decomposition, access to the river would improve for visitors. Over the long term, in 5 to 10 years, willows and cottonwoods would re-establish in areas previously occupied by tamarisk. This may enhance birdwatching opportunities and create the shade that improves fish habitat.

Roadless Character—Road construction or maintenance is not proposed for this project. The proposed action is not anticipated to influence the roadless character of Mills Canyon.

Cumulative Effects—Reconstruction of Mills Canyon Campground would occur during the 2007 summer season. There will likely be increased noise and vehicles if both projects (campground work and tamarisk control) occur during the same time. However, if the campground is closed for construction, the closure for herbicide application would have a reduced impact. A bridge on FR K600 will also be replaced. Bridge replacement will require closing the road. This may conflict with tamarisk treatment activities. This will also increase the period that Mills Canyon is not available for recreation during the 2007 summer season. If the Canadian

River IRA is proposed for wilderness, this designation may affect maintenance of the tamarisk treatments. They would be more difficult and require completion using manual methods. Future treatments would likely become more expensive and time consuming and less effective.

Scenic Resources

Alternative 1: No Action

Tamarisk will continue to be a visual element along the riparian area of the Canadian River. Viewers who are not aware that tamarisk is an invasive species, may see the plant as enhancing the scenic quality. If a viewer is aware that they are not native to this region and concerned about the impacts to native species, tamarisk may be seen as detrimental and not enhancing the scenic quality.

Cumulative Effects—No cumulative effects expected from this alternative.

Alternative 2: Proposed Action

There would be a short-term loss of scenic quality for the first 2 years, while dead tamarisk stems are visible. The herbicide imazapyr does kill other species of plants, and there may be some collateral loss as well. The aerial method is very precise, as seen in other treatment areas along the Canadian River and Ute Creek. Figure 2 shows a cottonwood that was successfully avoided, while the tamarisk were treated at the Ute Creek treatment area in northeast New Mexico.

Figure 2. Example of an area where tamarisk were treated with herbicide and the cottonwood was retained.

While tamarisk contributes to the scenic quality, the river, canyon walls and entire riparian vegetation community are the primary features of the scenic resources. This short-term loss of quality would meet the Visual Quality Objective of Partial Retention, where management activities remain visually subordinate to the characteristic landscape. The visual influence of the dead tamarisk would be subordinate to the dominant landscape. Tamarisk that have been treated appear as grey thickets along the riparian area.

The impacts to scenic quality will be reduced as the number of tamarisk stems decline due to cutting or decomposition. Establishment of native willows and cottonwoods would enhance scenic quality. There may also be additional views to the river with changes in vegetation, which is a positive scenic feature. Near the campground, the berm that developed may be scoured away in a flood event. This would improve views to the river.

Wild and Scenic River Eligibility—The proposed action would be consistent with the values that contributed to the eligibility of the Canadian River as a scenic river. There will be short-term impacts to scenic and recreational qualities. After the expected treatment period, recreation opportunities would not be impacted, and possibly improved with increased river access. The short-term reduction in scenic quality would not change the eligibility since tamarisk is not a dominant feature among the scenic resources. After the completion of treatments and as willows and cottonwoods are established, the scenic quality should meet or exceed the pretreatment scenic quality. The geologic and historic values would be unchanged.

Cumulative Effects—When considered with other past, present, and reasonably foreseeable future activities in Mills Canyon, this project would not result in cumulative effects on scenic resources. The overall scenic character of the canyon would be retained.

Heritage Resources

Affected Environment

The Canadian River Canyon section of the Kiowa National Grassland has received relatively little archeological investigation. Approximately 150 known and recorded archeological sites exist on the Kiowa National Grasslands, a number of which occur within or near the Canadian River Canyon, and it is assumed that there are many as of yet unrecorded sites. The historic period (ca AD 1700 - 1950) is better understood than the prehistoric period of the area, as historic sites are more numerous and most visible across the landscape.

Of the 16 miles (approximately 540 acres) currently being analyzed within the Canadian River corridor in this project, only 5 previous heritage resource surveys have been conducted along the stretch of the river through Forest Service-administered lands. Approximately 534 acres have been previously systematically surveyed adjacent to the Canadian River on the canyon floor, including the entire Mills Canyon Campground. Only one previously recorded heritage resource site is known to exist within the proposed project boundaries: the Mills Orchard Ranch Site. In addition to the 1 site within the project area, there are 11 known sites outside the active flood plain that are in or immediately adjacent to the canyon bottom within 500 meters of the project. All 11 of these sites lie outside the treatment areas and would not be affected by the proposed activities.

Previous archeological investigations in and near the Canadian River Canyon and in the adjacent Central High Plains region have revealed that humans have used the area for at least 11,500 years, beginning with the Paleo-Indian period (11,500- 7,000 years Before Present). Even though relatively few Paleo-Indian sites, mainly campsites, have been documented in the area, the area was probably as heavily populated during that period than any other part of the Central High Plains. The Canadian River and its tributary canyons would have supplied a reliable water source for most, if not all of the year. Archaic period sites, mainly lithic scatters, are undoubtedly common in the region, but little is known about their nature or distribution across the landscape. A number of rockshelters are known to exist in the canyon, and several have been recorded. Most of these probably date to the Archaic period, based on the presence of groundstone and other stone artifacts. Many have evidently been looted and surface collected over the last 100 years or so by local ranchers and landowners.

The region has seen major fluctuations in environmental conditions over the past 12,000 years, and it is evident from the known archeological record that the low precipitation averages

combined with shallow, poorly developed soils were never adequate to induce prehistoric agriculture. Therefore, no major population centers appeared within the Central High Plains region until the early to mid-20th century.

The analysis area lies within and adjacent to the Canadian River corridor, an alluvial environment that was certainly, in prehistoric times, a perennial water source. In normal or wet periods, the Canadian River Canyon would have supported many forms of wildlife that is still found there today, including deer, elk, bear and mountain lion, along with a variety of flora. In addition, the plains above the canyon would have supported abundant grasses, which in turn would have supported large herds of bison and a wide variety of other small game and a limited number of floral resources. For the vast majority of the prehistoric period, nomadic hunter/gatherers followed the seasonal migrations of game across the landscape, camping near reliable water sources and constructing temporary and archeologically ephemeral structures for thousands of years. The Jicarilla Apache and Kiowa tribes, among others were historically documented in the area from the 17th century to the late 19th century.

The historic period (ca. AD 1700 - 1950) is probably the most visible archeologically in the area. These sites, which predominantly date from the late 19th century to the early 20th century, include homesteads and farms, which may consist of house and/or barn foundations, wells, windmills and livestock corrals. Today, most homestead sites generally consist of limited amounts of scattered trash and perhaps a few features suggesting the former locations of structures.

Given what data are available to date and given the history and prehistory of human occupation in the area, it is reasonable to conclude that most yet-to-be-discovered sites in the Canadian River Canyon will be prehistoric artifact scatters, rockshelters, campsites, and historic homestead remains. It is more likely that most heritage resources in this canyon exist on the higher terraces and in the rockshelters that occur high above the flood plain. Only the above historic site has been documented on the active flood plain. No rock art has been documented in the canyon.

Environmental Consequences

Alternative 1: No Action

If the no action alternative were to be applied, heritage resources would remain in their similar state and there would be no adverse effect. The frequent flooding through this canyon has created a setting that is not conducive to the preservation of heritage resources. Even if tamarisk were to remain in this area, it would not be likely to cause significant direct or indirect effects.

If tamarisk continues to expand to areas where heritage resources are located, effects to the resources may occur. These effects may include minor changes in surface erosional patterns or bioturbation (root disturbance), which could result in loss or misinterpretation of information. The trend of expansion of tamarisk could have an impact on historically procured plant materials that the Jicarilla Apache identified by continuing to invade and replace native plant species.

Cumulative Effects

There have been a variety of activities that have taken place or will take place in the vicinity of the canyon. In 2001, there was a 201-acre prescribed burn in the proposed project area, located along the west bank of the Canadian River just south of Mills Canyon Campground (Cibola National Forest Project No. 2001-03-054). Four heritage resource sites are located within that

project area. However, all four were avoided and protected from the prescribed burn, resulting in no effect to the resources.

It is expected that minor ATV use will continue into the foreseeable future, which has the potential to impact heritage resources. These impacts will most likely be minimal in nature, and may include continued erosion and damage to surface artifacts and features from ATVs crossing through site boundaries. At this time, ATV use has not significantly affected any known heritage resources, and proposed management of the use of motorized vehicles on National Forest System (NFS) lands will help to address this issue in the future.

Other activities that have taken place in or near the canyon in the past, are currently taking place, and are expected to take place in the future include recreation, wildlife management, fire management, vegetation management (thinning), and herbicide use for tamarisk control on private lands. Livestock grazing within the riparian area and canyon bottom is limited in time, number, and duration of use per the allotment management plans. The central portion of the Canadian River Canyon on K-91 is no longer authorized under grazing permit. Mills Canyon Campground is an 8-unit developed campground used primarily during the summer months. A decision made in May 2006 would expand this facility to a 12-unit campground with the same amenities that currently exist (picnic tables and vault toilets). Dispersed camping, hunting, and firewood gathering, prescribed and slash pile burning, and the thinning of piñon and juniper tree stands will continue to occur in areas near the canyon bottom. Potential impacts from these activities include artifact compaction and displacement, disturbance to features or structures, and short-term erosion. Most of these activities will take place outside this proposed project's area of potential effect and are not concentrated in any one area.

This alternative would have no additive effect to these past, present, and reasonably foreseeable actions. There would be no cumulative effects from implementing this alternative.

Alternative 2: Proposed Action

For heritage resources, there would be no adverse effect because ground-disturbing project activities would be confined to the river channel or within the gaps between the features of the recorded site. Other known heritage resources in the canyon are mainly found on the river terraces and benches above the flood plain outside treatment areas. Much of the proposed mechanical treatment areas are near the known site, and have been previously surveyed for heritage resources. For those areas that have not been surveyed, the tamarisk is so thick that survey is not practical. As noted, however, due to the nature of the braided stream channel where tamarisk grows, the potential for heritage resources in this area is very low.

Aerial spraying and hand treatment would have no direct or indirect effects to most heritage resources as there would be no ground disturbance and this is a highly disturbed environment with little to no potential for archeological sites. There is some potential to affect plants that American Indians utilize. However, currently no tribes gather plants in the Canadian River area. Mechanical treatment would have the potential to affect heritage resources. The types of direct effects that could occur include displacement or compaction of artifacts and damage to surface features and structures that would result in a loss of integrity. However, given the nature of this environment it is unlikely that heritage resources remain within the flood plain in the area of potential effect, and that the portions of the known site AR-03-03-009/LA141954 that are within the proposed treatment area contain no features or artifacts, these potential effects would not be adverse. Burning has the potential to affect heritage resources primarily by destroying perishable

materials associated with the site. However, no fire-sensitive sites have been identified within the area of potential effect and, as noted, few if any sites are expected to occur within the flood plain.

Cumulative Effects

There have been several activities that have taken place or will take place in or near the canyon. In 2001, there was a 201-acre prescribed burn in the proposed project area, located along the west bank of the Canadian River just south of Mills Canyon Campground (Cibola National Forest Project No. 2001-03-054). Four heritage resource sites are located within that project area. However, all four were avoided and protected from the prescribed burn, resulting in no effect to the resources.

Low levels of ATV use will likely continue into the foreseeable future, which has the potential to impact heritage resources. These impacts would be minor, and may include continued erosion and damage to surface artifacts and features from ATVs crossing through site boundaries. At this time, ATV use has not significantly affected any known heritage resources, and proposed management of the use of motorized vehicles on National Forest System (NFS) lands will help to address this issue in the future.

Other activities that have taken place in or near the canyon in the past, are currently taking place, and are expected to take place in the future include recreation, wildlife management, fire management, vegetation management (thinning), and herbicide use for tamarisk control on private lands. Livestock grazing has taken place in the past, but livestock grazing no longer occurs within the riparian areas and canyon bottom. Mills Canyon Campground is an 8-unit developed campground that is used primarily during the summer months. There is a May 2006 decision to expand this facility to a 12-unit campground with the same amenities that currently exist (picnic tables and vault toilets). Dispersed camping, hunting, firewood gathering, prescribed and slash pile burning, and the thinning of piñon and juniper tree stands will continue to occur in areas near the canyon bottom. Potential impacts from these activities include artifact compaction and displacement, disturbance to features or structures, and short-term erosion. Most of these activities will take place outside the proposed project's area of potential effect and are not concentrated in any one area.

When the effects of the tamarisk control, continued ATV use, camping, hunting, and all past and future undertakings are combined, the cumulative effects to heritage resources would be minimal. All project activities are evaluated for their potential to affect heritage resources. Standard procedure on the Kiowa National Grassland requires that significant heritage resources are protected and avoided during all project activities. When a case arises where there is no other option but to perform project activities within the boundary of a heritage resource site, the projects are designed to protect and avoid all contributing/significant qualities of the site that may contribute to their eligibility to the National Register, and/or archeological data recovery is undertaken to mitigate any adverse effects. As avoidance of heritage resources is the preferred method of mitigating potential impacts to sites, and the overall site density in the area of potential effect is expected to be low, there would be no significant long-term cumulative effects to these resources from this alternative.

Human Health and Safety

Affected Environment

The proposed treatment area is in a sparely populated area located in Harding County, New Mexico, which contains between 700 and 800 residents. The closest municipality is the Village of Roy, located approximately 18 drivable miles from the proposed project site, which has approximately 300 people living within the vicinity.

Any noxious weed treatment may pose potential risk to human health and safety in two types of exposures, *general exposure* and *accidental/incidental exposure*. The term general exposure refers to human exposure resulting from the normal use of the chemical. Accidental/incidental exposure scenarios describe specific examples of gross overexposure associated with mischance or mishandling of a chemical. The two basic groups associated with herbicide exposure include workers and the general public. Workers include those who apply the herbicide and those who monitor after treatment. The general public who use the Canadian River Canyon, either for short periods of time (less than a day) or longer periods of time (more than a day) are the second group potentially affected. The potential hazards involved are:

- Inadvertent injury by machinery or equipment to workers or the public.
- Injury from direct exposure to herbicides from either a backpack or aerial application to workers or the public.
- Injury to workers during the mixing process.

Worker Exposure

Workers who are involved in herbicide application face accidental exposure in a couple of different ways. Because part of the proposed treatment involves aerial application, the greatest threat of accidental exposure to workers would be through the mixing process. All handlers and mixers of pesticides would be required to wear mandated personal protection equipment (PPE) as prescribed by FIFRA and as well as the product label, Material Safety Data Sheet (MSDS) and a prepared job hazard analysis (JHA) including long-sleeve shirt and pants, chemical resistant gloves, leather boots plus socks, and eye protection.

Workers who perform ground application using a pump-up backpack sprayer could face possible exposure through leakage of the backpack. Such workers would be required to wear the previously mentioned PPE and a chemical resistant vest. During herbicide application, fresh rinse water and eye wash kits will be available to workers who might encounter accidental exposure.

Those workers who are in the area following herbicide application may risk exposure during the monitoring process. This exposure would primarily be exposure to residue on vegetation. Monitoring workers would also be required to wear PPE as prescribed by the label.

Workers involved or present during mechanical operations, such as chain saws or shears could face additional hazards such as cuts, scrapes, abrasions, fractures or burns. These workers would be required to wear the proper PPE as described in the Forest Service Health and Safety Code Handbook and as described in the JHA. Workers involved in herbicide application using an all-terrain vehicle (ATV) must wear an approved helmet as specified by the Forest Service Health and Safety Code Book, Forest Service Handbook 6709.11, Section 13.22.

How sensitive the individual is to a chemical substance partly determines the impacts to these two groups of people. In other words, some people may be hypersensitive and/or allergic to chemical compounds and their responses are reactions associated with irritation to the nose, eyes, or skin.

General Public Exposure

In addition to the workers doing the various treatments there may be exposures to people living, working or recreating in the treatment area that are exceptionally sensitive to any chemical exposure in the environment. While the Forest Service only uses herbicides determined by the Environmental Protection Agency (EPA) and other research to be safe (low risk), even when applied following the label instructions the risk assessments indicate that some exposure remains (albeit very low).

General public use of the area includes day use and overnight use within and around Mills Canyon Campground. Most of the day use includes the public picnicking, riding all-terrain vehicles (ATVs), riding horses, fishing, hunting, and bird watching. Most overnight use is by campers along the river corridor.

A small percentage of the population, it must be noted, may be described as having multiple chemical sensitivity. Multiple chemieal sensitivity (MCS) has been described as a "medical condition characterized by debilitating chemical sensitivities" (MCS Task Force 2000). A 1997 New Mexico Behavioral Risk Factor Survey completed by the New Mexico Department of Health, Office of Epidemiology indicates 2 to 3 percent of those responding to the survey instrument are chemically sensitive with up to 16 percent of the New Mexico population possibly sensitive (MCS Task Force 2000, Dr. Ann McCampbell M.D.). Conflicting views exist in the medical and scientific community about multiple chemical sensitivity. According to the United States Labor Department, Occupational Safety and Health Administration (OSHA), "Multiple Chemical Sensitivities (MCS) is a highly controversial issue. In theory, MCS is an adverse physical reaction to low levels of many common chemicals. Chemical sensitivity is generally accepted as a reaction to chemicals but debate continues on whether MCS is classifiable as an illness. There are a number of synonyms for MCS, including 20^{Th} century disease, environmental illness, total allergy syndrome, idiopathic environmental illness and chemical AIDS. Proposed theories to explain the cause of MCS include allergy, dysfunction of the immune system, neurobiological sensitization, and various psychological theories. There is insufficient scientific evidence to confirm a relationship between any of these possible causes and symptoms. Due to the lack of definite information, an evaluation must be performed by a physician knowledgeable of the symptoms of this condition." (U.S. Dept. of Labor, OSHA Web site)

It is not possible to evaluate the potential effects on individuals with "multiple chemical sensitivity." It is unlikely that the treatments would expose people with MCS to compounds that would affect them. Mills Canyon is isolated, relatively unpopulated, and would be closed to the public during herbicide application.

Human Health Risk Assessment Summary

The EPA has approved the herbicide proposed for treatment of this plant. The toxicity of imazapyr has been relatively well characterized in experimental mammals. The Forest Service completed a human health and ecological risk assessment for imazapyr that incorporated the most up-to-date scientific information available (SERA, 2004). All of the mammalian information is

contained in unpublished studies that were submitted to the U.S. EPA as part of the registration process for imazapyr and were obtained and reviewed as part of the risk assessment.

EPA has established a reference dose (RfD) of 2.5 mg/kg/day, which was derived from established no observable adverse effect levels from animal studies. Because no human health studies exist for imazapyr, extrapolation of animal study data was required. EPA determined the RfD incorporating an uncertainty factor of 100 (10 for species-to-species extrapolation and 10 for sensitive subgroups in the human population). The reference dose is the level below which no observable adverse effects would be expected in the population. Risk for both workers and members of the general public are characterized quantitatively by using a hazard quotient, which is the ratio of the exposure estimate to the chronic RfD.

The risk assessment analyzed a range of application rates from 0.03 lb/acre to 1.25 lb/acre. It addressed aerial application and hand application methods, exposures to workers and the public, and assessed the consequences of accidental spills. The maximum application rate used in this project would be 1.0 lb/acre of acid equivalent. This rate is below the maximum rate analyzed in the SERA risk assessment. This assessment determined that applications up to 1.25 lb/acre result in exposures well below the levels that would result in adverse effects to workers, members of the public, as well as terrestrial or aquatic animal species. The risk assessment work sheets used to calculate exposures and relative risk levels specific to the proposed application rate are included in the project record. Although there are risks involved with any herbicide, imazapyr appears to pose little to no adverse health impacts when applied according to label instructions.

Although the mode of action of imazapyr in humans or other mammals is unclear, this is at least partially a reflection of the apparently low and essentially undetectable acute and chronic systemic toxicity of this compound. A number of multigeneration reproductive and developmental studies have been conducted and no adverse effects on reproductive capacity or normal development have been demonstrated. Tests of carcinogenic and mutagenic activity are consistently negative, and the U.S. EPA has categorized the carcinogenic potential of imazapyr as *Class E: evidence of non-carcinogenicity*. The weight of evidence suggests that imazapyr is not directly neurotoxic, and the available data do not suggest that systemic toxic effects are plausible after dermal or inhalation exposures to imazapyr. Some evidence suggests that imazapyr may affect some aspects of the endocrine function, but the results are inconclusive. (SERA, 2004)

Environmental Consequences

Alternative 1: No Action

If there was no application of herbicide, there would be no potential for exposure to either workers or the general public. Therefore, there would be no direct or indirect effect to health and safety as a result of the no action alternative.

Cumulative Effects

Given that there are no direct or indirect effects to health and safety of workers or the public, there would be no potential for cumulative effects.

Alternative 2: Proposed Action

Direct and Indirect Effects to Workers and the Public

Under this alternative, potential health risks to workers may include injuries from the manual and mechanical actions taken to control salt cedar. These are relatively minor and include cuts, burns, abrasions, fractures, skin irritation and allergic reaction during the use of chain saws and/or shears. There is also the possibility of accidental fuel spills using this equipment. Apart from these hazards, workers could also face potential risks from direct herbicide exposure, either during the mixing process, application process or monitoring process. Imazapyr can be mildly irritating to eyes and skin. This is the most likely effect to occur if care in use is not observed or personal protection equipment (PPE) practices are not employed. The SERA risk assessment addresses the effects of herbicide exposure.

The analysis for this proposal used SERA work sheets provided with the risk assessment using the proposed application rate of 1.0 lb/acre. The work sheets calculate exposures and hazard quotients (the ratio of the exposure to the RfD) for a number of scenarios. Tables 9 and 10 summarize the exposures and hazard quotients for workers and the general public, respectively. All of the scenarios result in exposures to workers and the public well below EPA's RfD. Exposures to imazapyr do not lead to estimated doses that exceed a level for concern for either workers or members of the general public at the application rate. This indicates the herbicide use would not affect worker and public health and safety. Use of imazapyr to control salt cedar is not without risk. All chemical exposure results in some level of health risk, the risk primarily being a function of the dose, or amount a person is exposed to over time. However, the same literature that raises concern over health effects also clearly reports that effects occur at doses significantly higher than that expected through use in this project. The estimated dose of imazapyr that a worker or person of the general public may be exposed to through this project would be below that determined to be safe by the U.S. EPA for a lifetime of daily exposure. Therefore, no health effects and risks to workers and the general public are anticipated from imazapyr use in this project.

Table 9. Potential worker dose rates and hazard quotients for various exposure scenarios.

Worker					
Exposure Scenario	**Dose (minimum and maximum)[1]**		**RfD[2]**	**Hazard Quotient[3]**	**Factor (1/HQ)[4]**
General exposure during backpack spray operations	Minimum	0.0005	2.5	0.0002	5,000
	Maximum	0.08		0.032	31
General exposure during aerial spray operations	Minimum	0.00024	2.5	0.000096	10,416
	Maximum	0.08		0.032	31
Accidental or incidental exposures from contaminated gloves or spills	Minimum	0.00009	2.5	0.000036	27,777
	Maximum	0.0054		0.00216	463

[1] Mg/kg/day for general exposures and mg/kg/event for accidental and incidental exposures.

[2] Reference dose established by EPA – the acute or chronic dose below which no effects would be expected

[3] Dose÷RfD – indicates the ratio of the dose received relative to the RfD.

[4]The inverse of the hazard quotient, this represents the multiplication factor or increase in the dose that would be required to reach the RfD.

The extreme scenario for accidental worker exposure (wearing contaminated gloves for 1 hour or spills on hands or lower legs) results in a dose of about 0.0054 mg/kg/event. This level is well below the reference dose established by EPA. General exposure received during spray applications are similarly below the EPA reference dose. Even the maximum exposure from application would require a 31-times increase in the application rate to approach the RfD.

Herbicide exposure scenarios for the general public provide similar results to those for workers. Table 10 summarizes these scenarios. The results indicate that none of the exposures approach the EPA reference dose. The largest dose resulted from a scenario in which a child drank contaminated water after an accidental spill in a small pond. This would be a very unlikely occurrence given the application type and physical setting of this proposal.

Table 10. Potential dose rates and hazard quotients for the general public from various exposure scenarios.

General Public					
Exposure Scenario	**Dose (minimum and maximum)[1]**		**LOC[2]**	**Hazard Quotient (Dose/LOC)[3]**	**Factor (1/HQ)[4]**
Acute exposure from direct spray or vegetation contact	Minimum	0.00015	2.5	0.00006	16,667
	Maximum	0.0319		0.00128	196
Acute exposure from accidental spill	Minimum	0.006835	2.5	0.00273	781
	Maximum	0.455		0.182	5.5
Chronic exposure from fruit, water or fish consumption	Minimum	0.000000007	2.5	0.000000003	333,333,333
	Maximum	0.004456		0.00178	562

[1] Mg/kg/day for general exposures and mg/kg/event for accidental and incidental exposures.

[2] Reference dose established by EPA – the acute or chronic dose below which no effects would be expected.

[3] Dose÷RfD – indicates the ratio of the dose received relative to the RfD.

[4]The inverse of the hazard quotient, this represents the multiplication factor or increase in the dose that would be required to reach the RfD.

The indirect effects on workers might include any potential long-term effects from exposure. Although the mode of actions in humans is unclear, imazapyr has an apparently low and essentially undetectable acute and chronic systemic toxicity. An adequate number of multigenerational reproductive and developmental studies have been conducted and no adverse effects on reproductive capacity or normal development have been demonstrated. Tests of carcinogenic and mutagenic activity are consistently negative, and the U.S. EPA has categorized the carcinogenic potential of imazapyr as *Class E: evidence of non-carcinogenicity (*SERA, 2004*)*.

Indirect effects to workers would be low because of the relatively short term of this project and the fact that Forest Service workers in general do not routinely apply herbicides as a daily part of their jobs. Indirect effects to the worker population are probably a much lower probability because of the required protective measures to avoid potential contaminants and the relative short time spent in treatment and affected areas.

The direct effect to the public might include direct spray; contact with herbicide residue on plants or facilities; or ingestion of water containing herbicidal residue or ingesting food that contains herbicidal residue. Direct spray is not likely since access to the canyon would be restricted during spray activities. The potential indirect effects for the general public are similar to effects for the workers. These are considered in the SERA risk assessment (SERA, 2004, pages 3-14 to 3-22) and include scenarios for contaminated water, contaminated fish, and contaminated vegetation. The scenarios developed for the risk assessment tend to overestimate exposures. The risk assessment notes that "(m)ost of these scenarios should be regarded as extreme, some to the point of limited plausibility." (SERA, 2004, page 3-15) The risk assessment completed for the application rate planned in this project indicates that exposures to the public are well below the level of concern identified for imazapyr (see table 10). The one scenario that approaches the level of concern in the analysis would be extremely unlikely. This scenario involved a child drinking water from a small pond that had been directly sprayed, and resulted in exposure less than 20 percent of the level of concern.

Cumulative Effects

No one can guarantee the absence of a synergistic interaction between herbicides and/or other chemicals in the environment to workers or the public might be involved. For example, exposure to benzene, a known carcinogen that comprises 1 to 5 percent of automobile fuel and 2.5 percent of automobile exhaust, followed by exposure to any herbicide could result in an unexpected biochemical interaction. Analysis of the infinite number of materials a person may be exposed to or ingest in combination with imazapyr is outside the scope of this analysis.

Researeh indicates imazapyr can be applied in combination with other herbicides, although there are no plans to use any other herbicides with this application or treatment. No data have been encountered in the literature that permit a characterization of the joint action of imazapyr (i.e., synergism antagonism or additively) with most herbicides. The limited information encountered in the U.S. EPA files on mixtures of imazapyr with imazethapyr (SERA, 2004, p. 3-28) does not indicate substantial interaction. Over the past 3 years, the State of New Mexico has authorized funding for control of tamarisk both above and below this project area along the Canadian River. We anticipate that treatments for tamarisk would eontinue into the future until an acceptable level of eontrol is achieved. There are no other herbicide projects planned for this watershed on the Kiowa National Grassland, nor have there been any in the past.

The risk assessment provided for the Forest Service by SERA specifically considers the effect of repeated exposure in that the chronic RfD is used as an acceptable exposure even for acute exposure scenarios. Consequently, the risk characterizations presented in the risk assessment **encompass the potential impact of long-term exposure and cumulative effects.**

Social and Economic Factors

Affected Environment

The Canadian River, within the boundaries of the Kiowa National Grassland, separates Harding and Mora Counties. Mora County extends from the ridge of the Sangre de Cristo Mountains in the west to the Canadian River in the east. Harding County was founded in 1921 and extends westward over prairies and grasslands from the Canadian River. Soaring granite cliffs and canyons surround the river. The primary geographic feature of the area above the cliffs is its rolling grasslands and plains that support ranching and some farming.

The ownership pattern of these grasslands is a patchwork of Federal, State, and privately owned land primarily used for grazing and recreation. At one time, there was a nearby community called Mills, named for the orchard owner and operator for whom Mills Canyon is also named. Even though the place name is still in use, the community declined to a few homes and farms since the destruction of the orchards by flood in the early 1900s. There are two villages near the project area: Wagon Mound in Mora County and Roy in Harding County. Both are over 20 miles from the project area and have populations of 369 and 304, respectively (2000 Census). Even though Mosquero is the Harding County seat, Roy is the largest village in the county and accounted for 37 percent of the county population in 2000. Both counties are rural in character and have spread out populations. The 2000 Census showed 2.7 people per square mile in Mora County and only 0.4 per square mile in Harding County.

Two different population trends affect Mora and Harding Counties. The population of Mora County has been increasing due to the growth experienced in adjacent counties to the west. Harding County has been experiencing steady population decline throughout most of the 20th century. Its population in the 2000 Census was only 810 and was expected to decline to 774 by 2004 (see table 11).

Table 11. Population Change in Harding and Mora Counties, NM since 1990

County	1990	2000	Change	2004*	Change
Harding	987	810	-177 (-18%)	774	-36 (-4%)
Mora	4,264	5,180	916 (+21%)	5,212	32 (+1%)

* Estimated by US Census

This decline in population is related to the availability of employment and the changes in agricultural technology, which make ranching and farming less and less labor intensive. Farmers, ranchers, and agricultural wage workers make up 50 percent of employment in the county according to the Harding County Economic & Community Development Corporation. Meanwhile, eastern Mora County has steadier forms of employment. In nearby Wagon Mound, which has 126 working adults, 42.1 percent work in education, health and social services, 20.6 percent work in public administration, and only 5.6 percent work in agriculture and related fields. In Roy, 16.9 percent of employed adults work in agriculture or related fields.

Another demographic characteristic of Harding and Mora Counties is that the population of persons 65 and older is higher than that percentage is statewide (see table 12). The outward migration of working age persons exacerbates this trend in Harding County.

Table 12. Persons 65 years old and over in Harding and Mora Counties, New Mexico

	Harding	Mora	New Mexico
Persons 65 years old and over, 2000	28.30%	15.40%	11.70%

According to the 2000 Census, 44.9 percent of the population in Harding County and 81.6 percent of Mora County reported they were of Hispanic or Latino origin. Throughout New Mexico, 42.1 percent reported their ethnicity as Hispanic or Latino. Another significant minority in New Mexico is Native Americans (9.5 percent statewide). However, Harding and Mora Counties have a low percentage of people who reported their ethnicity as American Indian or Alaska Native when compared to the entire state (see table 13).

Table 13. Race and ethnicity in Harding and Mora Counties as compared to the state, 2000 Census

	Harding	Mora	New Mexico
White persons	84.3%	58.9%	66.8%
Black or African American persons	0.4%	0.1%	1.9%
American Indian and Alaska Native persons	1.4%	1.1%	9.5%
Asian persons	0%	0.1%	1.1%
Native Hawaiian and Other Pacific Islander	0%	0%	0.1%
Persons reporting some other race	10.6%	37.0%	17.0%
Persons reporting two or more races	3.3%	2.8%	3.6%
White persons, not of Hispanic/Latino origin	52.8%	16.9%	44.7%
Persons of Hispanic or Latino origin	44.9%	81.6%	42.1%

The median household income in Harding and Mora Counties falls $8,000 to $10,000 below the state median household income. The rate of persons whose income falls below the poverty line in Harding County is 2 percent lower than the State's (18.4 percent) and 7 percent higher in Mora County. (2000 Census)

Environmental Consequences

Alternative 1: No Action

With the no action alternative, tamarisk would continue to invade the riparian areas of the Canadian River and prevent the growth of native species. Because tamarisk consumes more water than native species, water availability for human uses would decrease as tamarisk spreads across the landscape (see "Soil and Water"). Water availability for irrigation and cattle is an essential resource for maintaining the agricultural industries in Mora and Harding Counties. For Harding County, this industry supports nearly half of all employment. In the long term, a reduction in water availability would negatively impact the economic sustainability of farming and ranching.

Cumulative Effects

The aerial herbicide application on the Canadian River is a collaborative effort among private landowners and State and Federal land management agencies. Landowners and managers adjacent to the Kiowa National Grasslands have and will continue treatments to eliminate tamarisk. Under no action, tamarisk would continue to be the dominant vegetation in riparian areas on the Kiowa National Grasslands. As a result, adjacent landowners would need to re-treat

their river segments to prevent the re-introduction of tamarisk from seeds coming from the national grassland. This would increase the cost of participating in invasive plant reduction for other landowners and would decrease the overall benefits of the effort.

Alternative 2: Proposed Action

The alternative would generate some employment to conduct aerial application and hand treatments, and to monitor the overall effort. Most of the employment will not have significant short-term impacts on the local economy. The New Mexico State University Range Improvement Task Force has been contracted to monitor the treatments and there are no local firms with the skills and equipment to carry out the aerial applications. The hand treatments might generate some local employment, if a local organization submits a successful bid for the contract. Overall, the direct economic impacts of the Forest Service activity would be minimal and short term.

The lead agency for the work on the Kiowa National Grasslands is the USDA Forest Service and the lead agency for the Canadian River Riparian Restoration Project is the Canadian River Soil & Water Conservation District. Funding in the past for work on the Canadian River has come from the New Mexico Legislature and flowed through the New Mexico Department of Agriculture and New Mexico State University. A variety of grant sources provide additional funding to support work on the Canadian River.

Based on cost estimates from 2006 application activities in nearby areas, the aerial application according to label directions and as described in the proposed action would cost about $167 per acre. Initial mechanical and herbicide combination treatments on mixed stands in areas accessible by equipment and in areas around Mills Canyon Campground would cost about $500 per acre. Initial treatment costs would total about $145,000. If the treatments were 95 percent effective, an equivalent area of about 27 acres would require followup spot treatments. Assuming a cost of $500 per acre for hand spraying the tamarisk sprouts, re-treatment would cost about $13,500. Each year this cost would decline, as fewer areas need additional treatments.

Restoration costs for planting native vegetation in areas where natural recovery is inadequate would vary based on access and the size of the area. Assuming that 15 percent of the treated area would require some planting, and costs would be $250-500 per acre (which includes the cost of removing tamarisk "skeletons" by mechanical or fire), then restoration would cost from about $20,250 to $40,500.

Based on these cost estimates, the direct cost of tamarisk control and native plant species restoration would range from $200,000 to $225,000, or $370 to $420 per acre.

In the long term, the local economy would receive the greatest direct benefit from avoiding negative economic impacts to the agricultural industry. The treatments may increase water yield once completed (See "Soil and Water" section). This would provide a more reliable source of water for human activities and stabilize the agricultural economic base of the counties. If we were able to place a cost estimate on improvements to biodiversity, water, ecosystem integrity, and aesthetics, the "benefit" of treating salt cedar would be much greater than projected eradication and rehabilitation costs.

During aerial treatment, recreation will be suspended in the canyon. This would have an impact on local recreation users because there is no comparable recreation area in the vicinity. The canyon provides opportunities for shade, wildlife viewing, hiking, camping, fishing and hunting.

Recreation users would be kept out of the canyon about 1 week and would shift minimal use to other recreation sites within the region.

Aerial treatments would generate noise pollution and traffic, another social effect that would result from this alternative. Since the Forest Service would close the canyon to recreational users during this time, there should be minimal impact from noise pollution to people. Adjacent landowners may experience some noise increase. Traffic on road K600 will increase in the short term when hand treatments are applied to the site. They will have minimal effect on adjacent landowners in terms of increased travel time, surface conditions and increased dust.

Wildlife related recreation activities such as wildlife viewing and hunting will experience short-term effects from the project. The loss of tamarisk along the river will provide less shade and cover when elk, deer and other game are in the area. In a few years, cottonwoods and willows would replace the tamarisk, which will allow for cover comparable to pre-treatment conditions. Hunters in the canyon may experience increased success rates for some time while native species become re-established. The decreased cover will make viewing of larger wildlife easier, while there may be some decrease in bird populations. Nevertheless, some birds will nest and forage in the area soon after treatments are finished. While there will be less diverse bird populations for birdwatchers in the short term, the diversity and populations will increase once native species are present.

Cumulative Effects

By returning riparian areas to their native vegetation, the canyon will be more attractive to recreation users and, in particular, camping and OHV use. Increases in these uses would be expected to have an impact on the retail sector. According to the 2002 Economic Census, there were 16 private nonfarm establishments in Harding County and 54 in Mora County at the time of the census. Because there are fewer than 100 firms, it is not possible to break this data down to examine the retail sector alone, which would be the most affected by increased recreation use. The lack of data makes it difficult to measure impacts from previous, present and reasonable foreseeable projects.

Completing treatment on this segment of the Canadian River in addition to the other segments that have already been treated and will be treated, will increase the success of suppressing tamarisk across the watershed. The collaboration that was established to accomplish this will be a good foundation for future projects that are beneficial to public and private lands.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994), provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies and activities on minority populations and low-income populations."

Harding and Mora Counties have populations of minority and low-income persons; however, the conditions and mitigations of the aerial herbicide treatments would not disproportionately expose these groups to substantial health risks. The risk assessment and human health effect analysis show that the general public will have limited routes of exposure to herbicidal residue. Besides direct contact, residue found in water or game and cattle is a possible source of exposure.

However, even with these routes being present, there is no evidence that chronic exposure will occur and mitigation measures will be in place to prevent acute exposure. Because the site of this project is determined by the location of natural features, no alternative site could have been selected to change the economic or social makeup of the affected population. The minority and low-income populations of the counties will be just as likely as other groups to experience environmental effects from this project.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). Implementation of alternative 2 may result in the short-term loss of non-target species and localized biodiversity in areas where imazapyr is used. However, the long-term effect is increased biodiversity for the forest through the eradication of salt cedar.

Unavoidable Adverse Effects

Alternative 1

No action would result in additional losses of native plant species as salt cedar infestations expand or become established in new areas along the river (see "Vegetation"). Loss of native plant species through conversion to salt cedar monocultures would also adversely affect wildlife habitat. Native species adapted to cottonwood/willow riparian areas would have fewer habitat components necessary for their use (see chapter 3, "Wildlife").

Alternative 2

The use of herbicides to control salt cedar would also kill some native vegetation along the margins of the infestations. Some willow exists immediately adjacent to the river on the edges of many salt cedar monocultures. Spray of these plants would be unavoidable (see chapter 3, "Vegetation").

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of plant productivity that are kept clear for use as a power line rights-of-way or road.

Alternative 2, control of salt cedar, would involve an irretrievable commitment of labor, fossil fuels, and economic resources.

Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during development of this environmental impact statement.

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Federal, State, and Local Agencies

United States Fish and Wildlife Service
Canadian River Riparian Restoration Project
Harding County Commission
Mora County Commission
Mesa Soil and Water Conservation District
USDI Bureau of Land Management-Taos
USDA Natural Resources Conservation Service
New Mexico State Land Office
New Mexico Department of Game and Fish
NMSU Mora County Extension Office
NMSU Harding County Extension Office
Village of Roy

Tribes

Kiowa Tribe of Oklahoma
Cheyenne-Arapaho Tribe of Oklahoma
Wichita and Affiliated Tribes
Jicarilla Apache
Mescalero Apache
Apache Tribe of Oklahoma
Comanche Nation

Others

Richard R. Anderson
Jerry Craft - Craft Partnership
Otto Fluhman - Fluhman Brothers LLC
E. H. Littlc
Jim Matison - Forcst Guardians
Honorable Brian K. Moore, State Representive
Gary D. Shaw
Virginia Cates
Center for Biological Diversity
George H. Ray, III
Lorence & Barbara Gonzales - Mestenito Ranch
Hilario and Leola Ebell
FBK Grazing Association - Wallace Bernor
Eugene Case
Donald Flowers
William Gruenerwald
Bryce and Barbara Smith
Andy Stahl - Forest Service Employees for Environmental Ethics
Richard Shaw - Shaw Ranch, Inc.

List of Agencies, Organizations and Persons to Whom Copies of the FEIS Were Sent

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document and those who submitted substantive comments on the draft environmental impact statement. In addition, copies have been sent to the following Federal agencies, State and local governments, and organizations representing a wide range of views regarding tamarisk control. Copies were also sent to the federally recognized tribes listed in the previous section.

U.S. Environmental Protection Agency, Office of Federal Activities
U.S. Environmental Protection Agency, Region 6
U.S. Army Corps of Engineers
Advisory Council on Historic Preservation
USDA Animal and Plant Health Inspection Service (APHIS)
National Marine Fisheries Service, Southwest Region
Natural Resources Conservation Service, National Environmental Coordinator
U.S. Coast Guard, Environmental Management
Federal Aviation Administration, Office of the Regional Administrator
Federal Highway Administration, Division Administrator
U.S. Department of Energy, Office of NEPA Policy and Compliance
U.S. Fish and Wildlife Service
Center for Biological Diversity
Forest Service Employees for Environmental Ethics
Forest Guardians
USDA, National Agriculture Library
USDI, Office of Environmental Policy and Compliance

Barbara Shaw
Tarah Burt
Canadian River Riparian Restoration Project
Rebecca G. Perry-Piper

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BISON. 2004b. Biota Information System of New Mexico BISON: Canadian Speckled Chub (Macrhybopsis aestivalis tetranemus). New Mexico Game and Fish. Available online: http://www.bison-m.org.

BISON. 2004c. Biota Information System of New Mexico BISON: Suckermouth Minnow (Phenacobius mirabilis). New Mexico Game and Fish. Available online: http://www.bison-m.org. Updated Bison copy 2006 on file.

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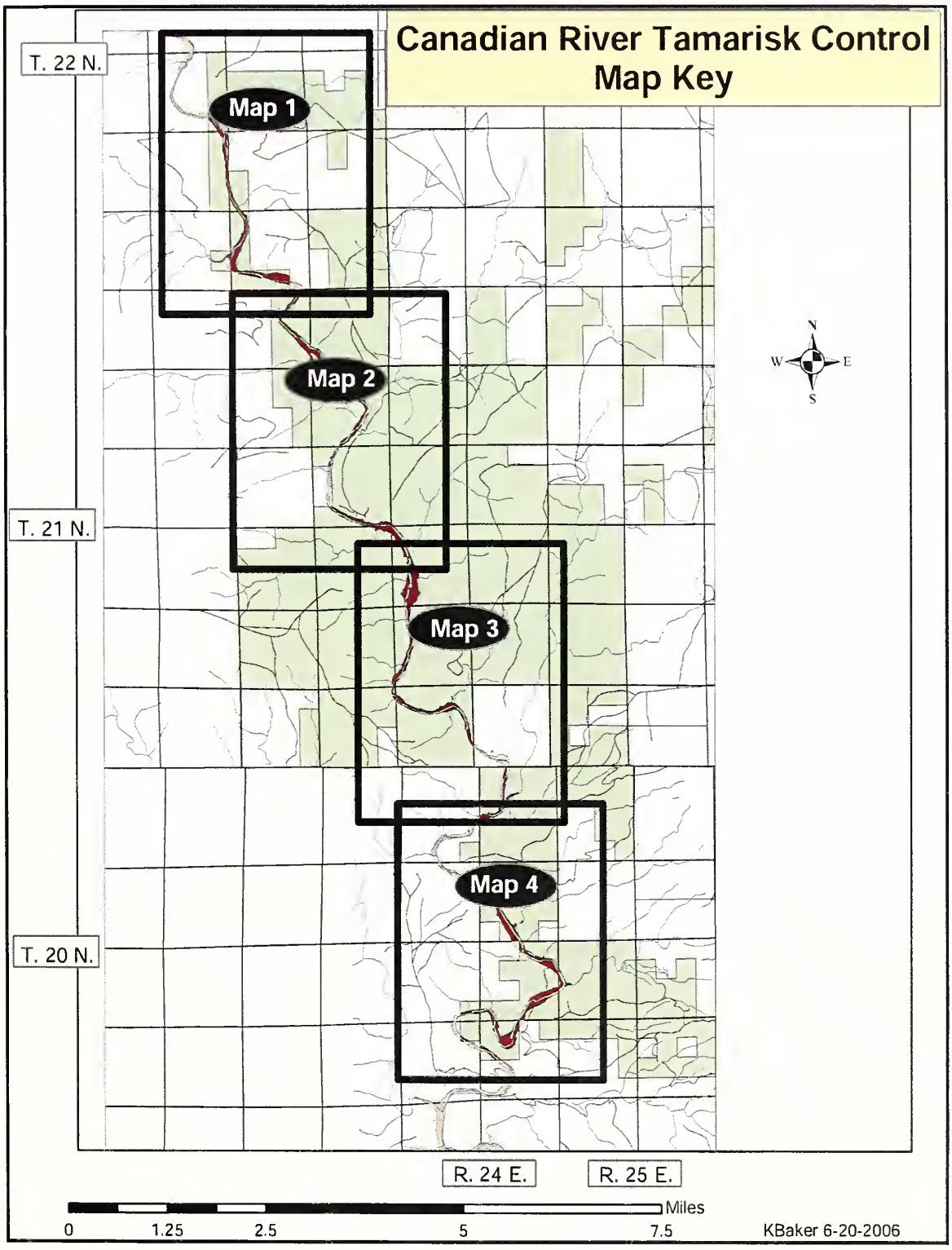
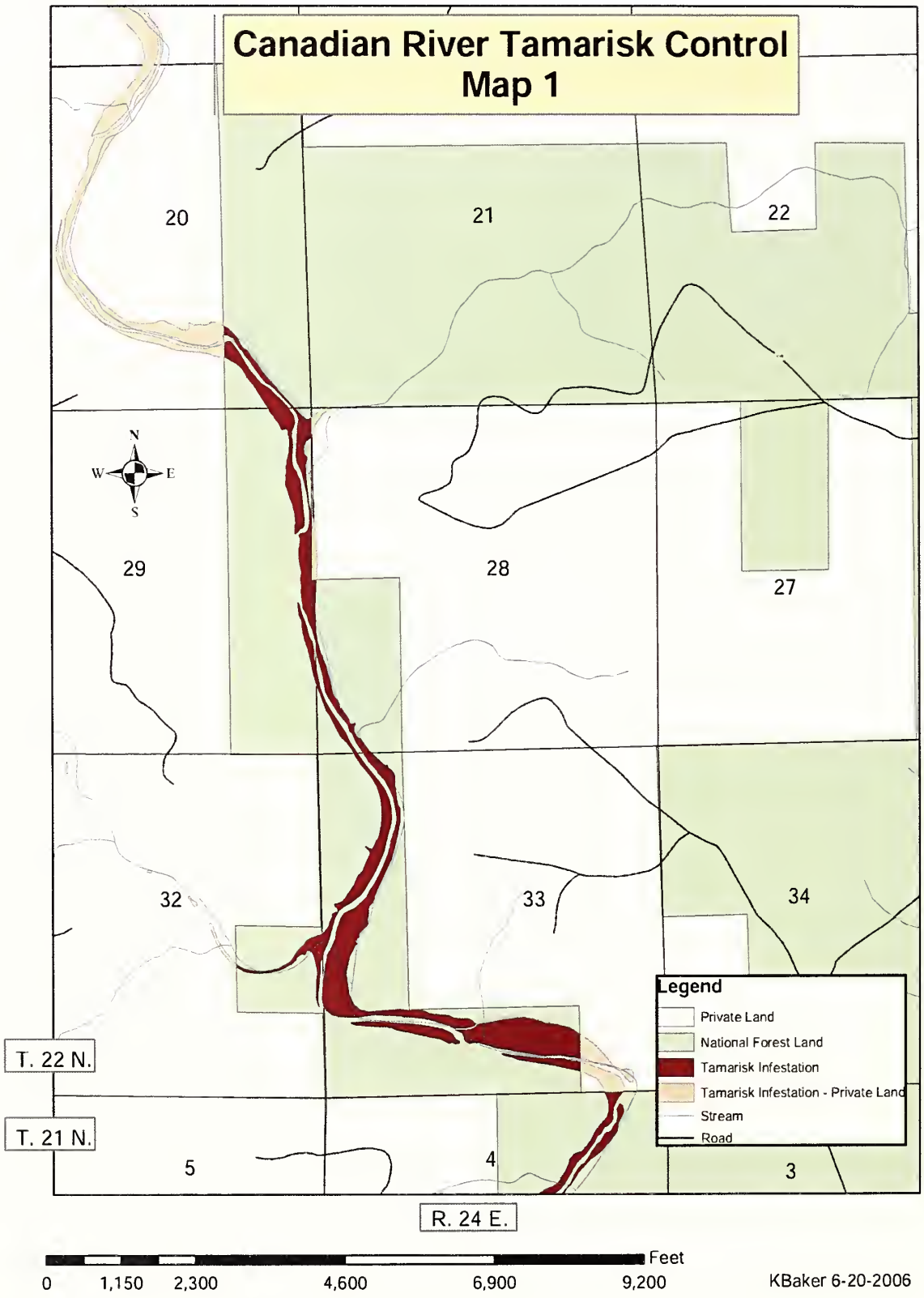
Appendix A – Map Package




Canadian River Tamarisk Control
Map 1
20
21
22
29
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27
32
33
34
5
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3
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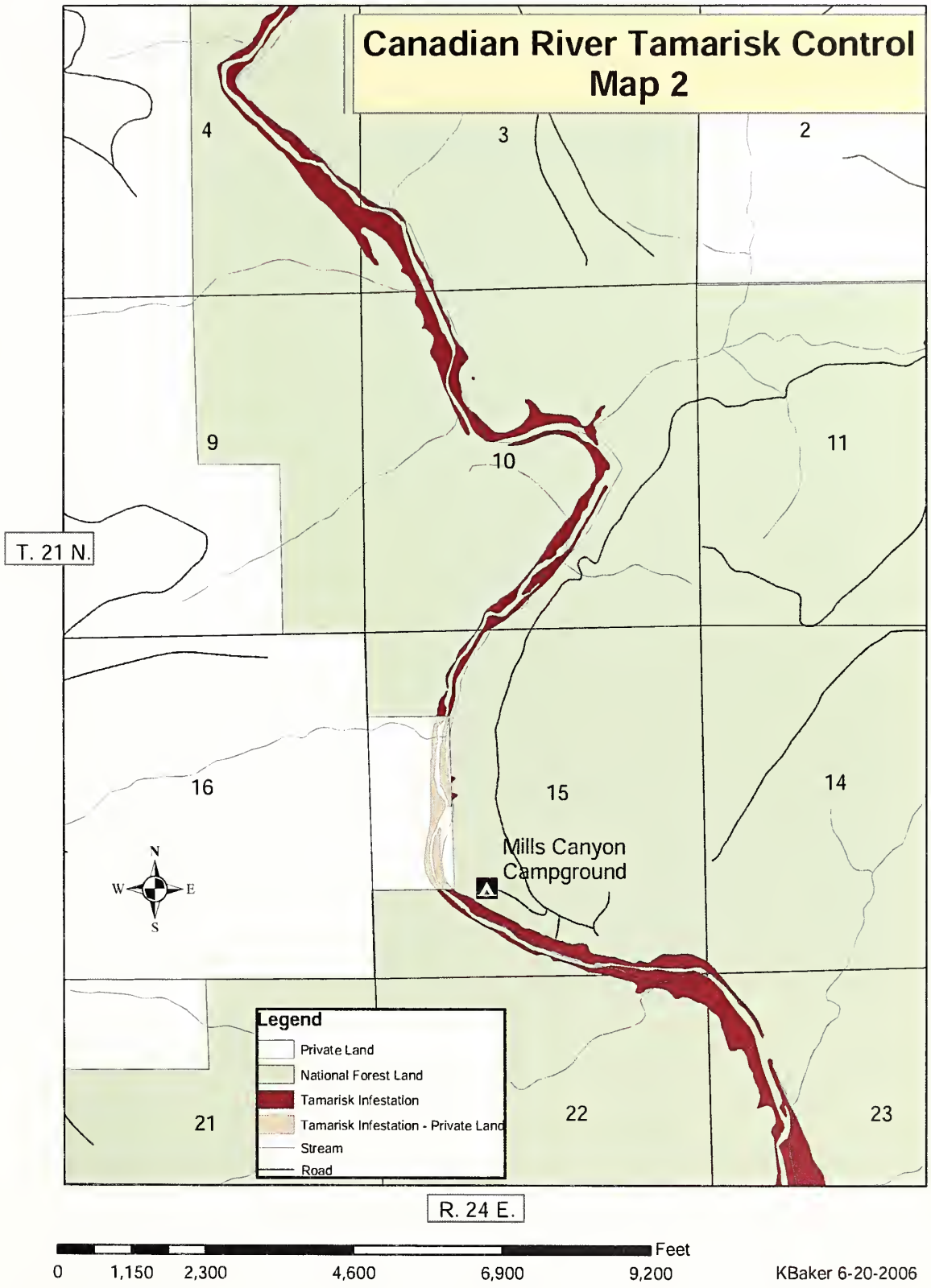
W
E
S
T. 22 N.
T. 21 N.
R. 24 E.
Legend
Private Land
National Forest Land
Tamarisk Infestation
Tamarisk Infestation - Private Land
Stream
Road
Feet
0
1,150
2,300
4,600
6,900
9,200
KBaker 6-20-2006


Canadian River Tamarisk Control
Map 2
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2
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10
11
T. 21 N.
16
15
14
Mills Canyon
Campground
N
W
E
S
Legend
Private Land
National Forest Land
Tamarisk Infestation
Tamarisk Infestation - Private Land
Stream
Road
21
22
23
R. 24 E.
Feet
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1,150
2,300
4,600
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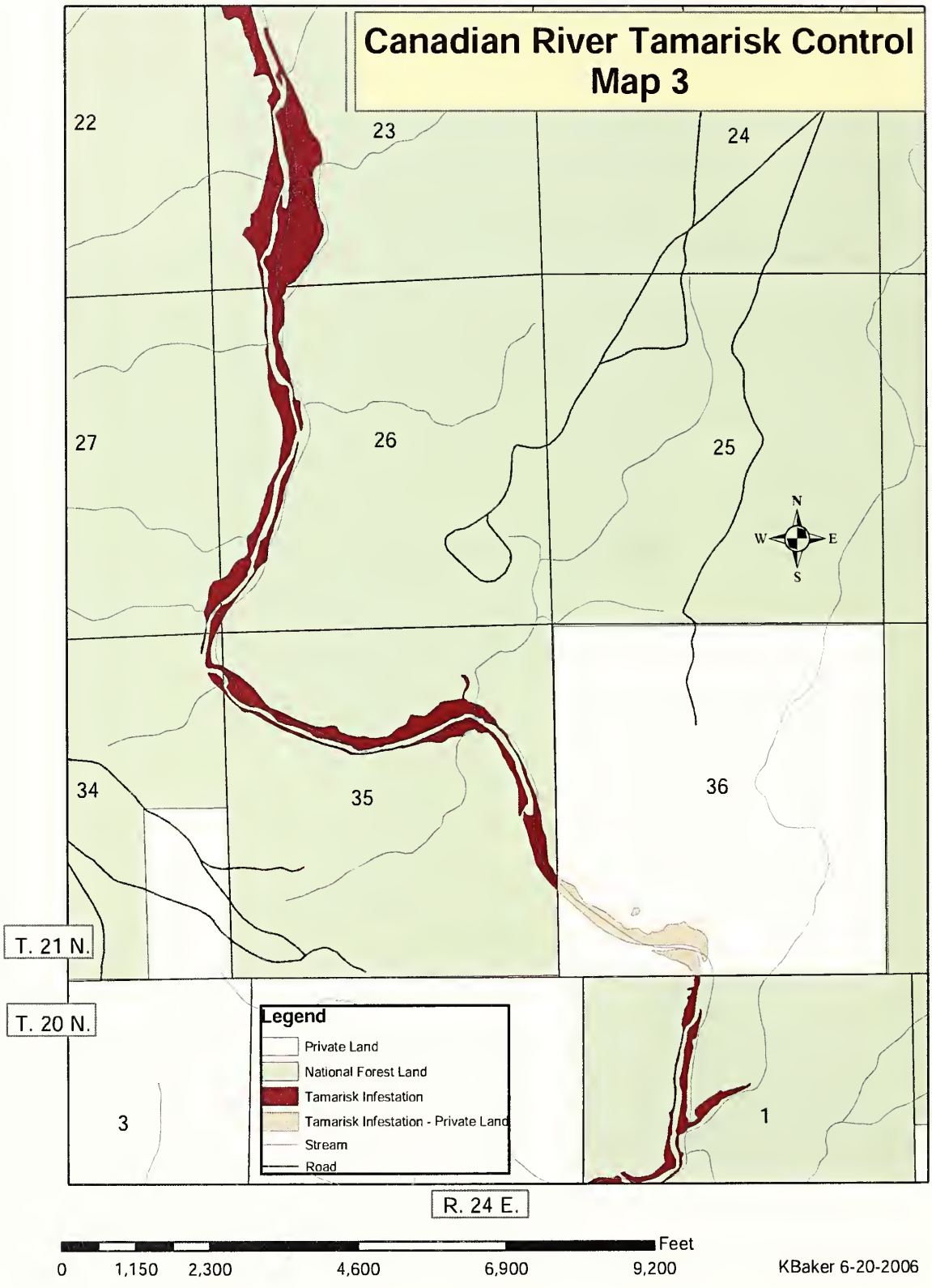
KBaker 6-20-2006


Canadian River Tamarisk Control
Map 3
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36
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T. 21 N.
T. 20 N.
R. 24 E.
Legend
Private Land
National Forest Land
Tamarisk Infestation
Tamarisk Infestation - Private Land
Stream
Road
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1,150
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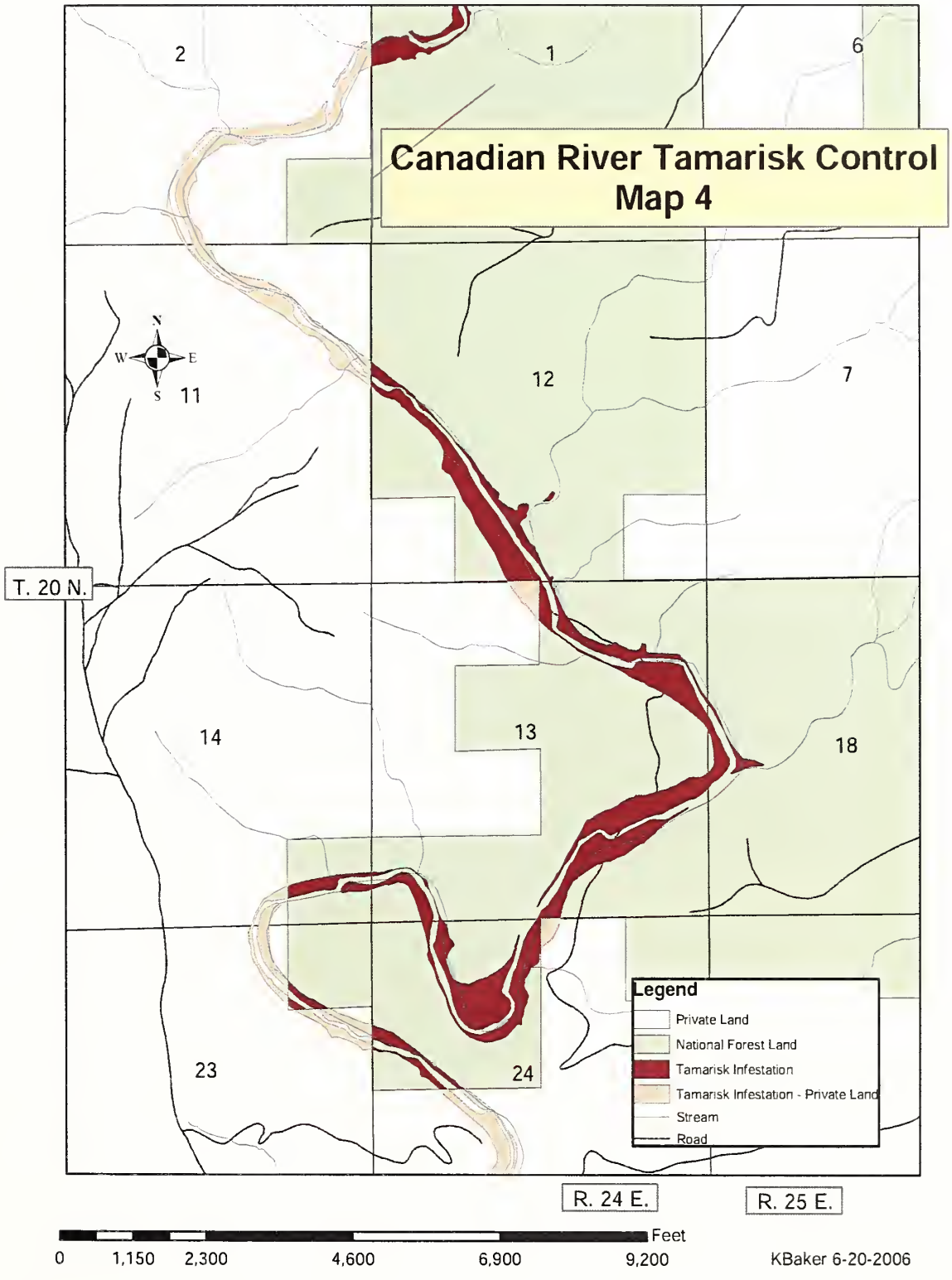
KBaker 6-20-2006


Canadian River Tamarisk Control
Map 4
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Legend
Private Land
National Forest Land
Tamarisk Infestation
Tamarisk Infestation - Private Land
Stream
Road
R. 24 E.
R. 25 E.
Feet
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KBaker 6-20-2006

Appendix B - Herbicide Spill Prevention and Cleanup Plan

Kiowa/Rita Blanca Grassland
Canadian River Salt Cedar Treatment Project
Cibola National Forest

Pesticide spill prevention and cleanup, as well as storage, transport, and disposal procedures are covered in detail in Forest Service Handbook (FSH) 2109.14, 60; pesticide storage, transportation, spills and disposal. Any herbicide projects would follow the direction given in this handbook.

Required Equipment

The following equipment will be available with vehicles used to transport herbicides and in the immediate vicinity of all spray operations.

1. Shovel
2. Broom
3. 10 lbs. of absorbent material or the equivalent in absorbent pillows
4. Large plastic garbage bags
5. Rubber gloves
6. Safety goggles
7. Protective overalls (tyvec)
8. Rubber boots
9. Portable eye wash

Clean water should be available at all times and not used for mixing herbicides.

Material Safety Data Sheets (MSDS) will be reviewed with all personnel involved in the handling of herbicides.

Cleanup of Herbicide Spills

Minor Spills

Keep people away from spilled chemicals. Rope off the area and flag it to warn people. Do not leave unless someone is there to confine spill and warn of the danger. If the herbicide was spilled on anyone, wash it off immediately. Confine the spill. If it starts to spread, dike it up with sand and soil. Use absorbent material such as cat litter, absorbent pillows, soil, sawdust or absorbent clay to soak up the spill. Shovel all contaminated material into a leak-proof container for disposal. Dispose of it as you would excess herbicides. Do not hose down the area because this spreads the chemical. Always work carefully but do not hurry and become careless. Control access to the spill area until all material is cleaned up.

Major Spills

The cleanup of a major spill may be too difficult for you to handle, or you may not know the proper procedure. In either case keep people away, give first aid if needed, and confine the spill.

Then call Chemtrec or the state pesticide authorities for assistance. Chemtrec stands for Chemical Transportation Emergency Center, a public service of the Manufacturing Chemicals Association with offices located in Washington, DC. Chemtrec provides immediate advice for those at the scene of emergencies. Chemtrec operates 24 hours a day, 7 days a week, to receive emergency calls. For help in chemical emergencies involving spills, leaks, fire, or explosions, call toll-free 800-424-9300, day or night. This number is for emergencies only. If a major spill occurs on a highway, have someone call the State Police or sheriff office for help. These telephone numbers should be in the vehicles being used in the project.

Important Telephone Numbers

1. New Mexico Poison Center, UNM Health Science Center: 1-800-222-1222
2. Safety Officer – Jeanette Early: 1-500-346-3900
3. On-Scene Coordinator, Chuck Milner, contact through Kiowa-Rita Blanca National Grasslands: 1-505-374-9652
4. Cibola National Forest Pesticide Coordinator – Rick Newmon: 1-505-346-3817
5. New Mexico State Police: 505-425-7504; Harding County Sheriff: 505-637-2231; Mora County Sheriff: 505-387-2222
6. Pesticide Manufacture, BASF Corporation: 1-800-832-help
7. ChemTrec (emergencies only): 1-800-424-9300

Appendix C – Public and Agency Comments on the DEIS

The Federal Register published the Environmental Protection Agency's Notice of Availability of the Canadian River Tamarisk Control DEIS on December 29, 2006. The Forest Service received comments from Rebecca G. Perry-Piper (an individual), Jim Matison (representing Forest Guardians and several other organizations), the Department of Interior, and the U.S. Environmental Protection Agency during the comment period, which ended February 12, 2007.

Rebecca G. Perry-Piper

Comment – The DEIS calls for salt cedar to remain uncut for 2 years following treatment, which is not consistent with the BMP identified in "Strategy for Long-Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River Systems, 2005-2014" (Strategy). This document states, on page 14, that treated salt cedar needs to be left uncut for 3 years following treatment. (Perry-Piper, comment 1)

Response – The statement referenced in the comment about leaving stems uncut for 3 years appears in the "Strategy" in the section titled "Management Techniques." The introductory part of this section states that "(N)o method will provide 100 percent control and followup treatments will be needed for many years to achieve desired results. As new techniques could become available during implementation of this strategy, decision makers will need to exercise managerial flexibility to adopt these new methods" (Strategy, p.10). Although herbicide treatment is not a "new method," the need for managerial flexibility exists within treatment methods. The ID team considered other information that exists about timing the cutting of salt cedar after imazapyr treatment to develop the proposed action. For example, the label requirements for the herbicide Habitat (a formulation of imazapyr labeled for aquatic use) state that "(A)fter application wait at least 2 years before disturbing treated salt cedar. Earlier disturbance can reduce overall control." The March 2005 document "New Mexico Options for Non-Native Phreatophyte Control," prepared by the Tamarisk Coalition, also provides for leaving tamarisk undisturbed for "a minimum of 2 years for the herbicide to work properly." The description of the proposed aetion in the DEIS provides for leaving dead tamarisk "for a minimum of 2 growing seasons before removing" (DEIS, p. 8), which is consistent with these documents.

Forest Guardians – Jim Matison

Comment – Overall, Forest Guardians firmly believes this draft environmental impact statement (DEIS) is inadequate and violates the National Environmental Policy Act on several basic levels. In response to the DEIS, we strongly recommend that an additional alternative of mechanical removal be reconsidered in detail, and not cursorily dismissed, as is the case in this analysis. In particular, we oppose aerial herbicide treatment along a riparian corridor and likewise believe that the DEIS fails to consider the other factors which have led to this infestation of tamarisk.

Response – The Forest Service disagrees with the comment that mechanical removal was "cursorily dismissed." Section 1502.14(a) of the CEQ NEPA implementing regulations (CEQ Regs) requires EISs to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." The interdisciplinary team considered the full range of vegetation management options, including mechanical removal, for treating tamarisk. The first section of chapter 2 of the FEIS under "Alternatives Considered in Detail" describes the process used to develop alternatives. The section "Alternatives Considered but Eliminated from Detailed Study"

describes the other alternatives, which include mechanical removal of tamarisk, and briefly explains why these alternatives were not studied in detail. The brief discussion of these alternatives meets the CEQ requirement.

We note the opposition to use of herbicides along a riparian corridor. The DEIS considers the relevant factors associated with existing tamarisk infestations and their control.

Comment – The Forest Service asserts in its DEIS that the project's purpose and need is twofold: first, to restore the hydrologic function for the Canadian River and second, to treat tamarisk before it can reseed upstream and downstream areas which have been or soon will be treated. However, the proposed action does not adequately respond to or address the ecological processes and ecological agents necessary to restore hydrologic function and, thus, is not responsive to the Forest Service's articulated purpose and need. We believe that analyzing both changes in the hydrograph and removal of keystone species like beaver must be done in order to develop an approach which will restore the ecological health of the Canadian River and its riparian ecosystems. Treating one symptom (killing the tamarisk) of the current dysfunctional ecological condition in the project area, while not addressing the conditions that allow tamarisk to dominate in its current condition, is naïve and misleading at best and will result in the project's failure. For these reasons we believe that the DEIS is fatally flawed and inadequate under the National Environmental Policy Act (NEPA), 42 U.S.C §§ 4321 et seq., and its implementing regulations.

Response – The DEIS, in the section "Purpose and Need for Action," states the following: "To help restore the hydrologic function of the Canadian River, the Kiowa National Grasslands needs to eradicate tamarisk (salt cedar) along the river corridor and its tributaries in both an effective and cost efficient manner. The need exists to promote the re-establishment of native riparian plant species and the wildlife habitat they provide." Tamarisk control was identified as one need to ***help restore*** the river's hydrologic function. It was not our intent that tamarisk control be interpreted as the one action that would restore hydrologic function of the Canadian River. The scope of the project is to address the control of tamarisk and provide for establishment of native vegetation. Responding to other "ecological processes and ecological agents necessary to restore hydrologic function" is outside the scope of the project.

The effect of tamarisk, or its removal, on streamflow is unclear. A several year study of tamarisk control and its effects on water salvage on the Pecos River (Hart et al. 2005) reported increases in ground water but could not identify changes in the water yield in the river (see Alternative 2 analysis in the "Soil and Water" section of chapter 3). Given the high variability in streamflow from year to year, even large changes cannot be attributed to a given treatment. For other effects on soil and water see the "Soil and Water" section of chapter 3. There are no impoundments on the Canadian River on Forest Service-administered land. Impoundments on private property can affect hydrology on Forest Service land. The Forest Service has no control over their construction or operation. Additionally, even though natural riparian plant recruitment may be hindered by reduced flood flows, the effect of these impoundments would not change the expected results of the project alternatives.

Comment – NEPA requires Federal agencies to consider alternatives to their proposed actions and examine the environmental impacts of those alternatives. This requirement implements NEPA's environmental policies. It requires Federal agencies to consider whether they can carry

out their proposed action in a less environmentally damaging manner, and whether alternatives exist that make the action unnecessary. In fact, the Council on Environmental Quality (CEQ) has described the alternatives requirement as the "heart" of environmental review. The courts have been correspondingly emphatic, calling the alternatives requirement the "linchpin" of the EIS. "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate."

The USFS failed to meet NEPA's alternatives requirement in the DEIS because it erroneously chose a narrow scope of alternatives, which did not offer *substantial ecological variation.* A proper variety of alternatives should explore more than just no action and the proposed action, which is all the DEIS does. The Forest Service should issue a revised DEIS which includes an actual restoration alternative of the proposed project, such as active restoration of native vegetation and remedies to the threats from hydrologic impoundment and livestock grazing. Simply put, the alternatives analysis in the DEIS must go beyond a mere analysis of using herbicide to treat the results of these current and historic management practices. The USFS is obligated by NEPA to examine action alternatives that differ from one another in ecological impact, i.e., action alternatives that will carry out the project purpose in a "less environmentally damaging manner" than the proposed action.

The range of alternatives to be set forth in an EIS is governed by the "rule of reason." Certainly, the USFS need not consider an infinite range of alternatives to its proposed action. However, the agency must meaningfully consider reasonable and feasible alternatives grounded in the need for resource conservation in and around the action area. We feel that "non-herbicide alternatives" falls well within the rule of reason.

Response – The Forest Service considered several alternatives in initial projeet development and in response to seoping results. See the response to the first Forest Guardians eomment.

Comment – NEPA establishes "action-forcing" procedures that require ageneies to take a "hard look" at environmental consequences.

Any EIS must provide enough evidence and analysis of environmental impacts for the USFS to make an informed decision, and for the public to comment aecordingly. The information presented in an EIS must be of "high quality," and include "accurate scientific analysis."

The herbicide proposed for use is highly toxie and may pose risks to human and environmental health. Aceording to the Journal of Pesticide Reform Fact sheet "Imazapyr is corrosive to eyes and can cause irreversible damage. Imazapyr containing herbicides are irritating to both eyes and skin." The journal further states that "Adverse effeets found in laboratory animals after chronic exposure to imazapyr include the following; fluid accumulation in the lungs of ferale mice, kidney cysts in male mice, abnormal blood formation in the spleen of ferrale rats, an increase in the number of brain and thyroid caneers in male rats, and an increase in the number of tumors and cancers of the adrenal gland in ferrale rats." The factsheet indicates that imazapyr can persist in soil for over a year, and that persistence studies suggest that imazapyr residues damage plants at coneentration that are not detectable by laboratory analysis. The factsheet also indicates that imazapyr moves readily in soil and has contaminated surface and ground water following aerial and ground forestry applications. The DEIS inadequately discusses these impacts.

Response – The Journal of Pesticide Reform factsheet on imazapyr is one source of information regarding the herbicide. The Forest Service contracted with Syracuse Research Associates, Inc. (SERA) to conduct a risk assessment for imazapyr. The SERA report, updated in 2004, provides a comprehensive evaluation of the human and ecological health risks associated with the herbicide's use in Forest Service programs. The SERA report included more than 250 published and unpublished references, including several on the effects cited in the comment. This evaluation determined that the formulations of imazapyr used in FS activities would not be likely to present adverse effects to humans or aquatic and terrestrial animal life. The EIS summarizes the risk assessment and adequately discusses the potential impacts that would be likely to occur with the proposed application.

Most of the chemical imazapyr will breakdown in soil in about 3 months. The chemical that would be used near water is labeled for aquatic use. If it does get into the water, directly or indirectly, the chemical will photodegrade in approximately 2 days. Additional information on imazapyr and movement and breakdown in soil and water is in the "Soil and Water" section of chapter 3.

Comment – The DEIS failed to disclose and analyze the conditions that have allowed tamarisk to flourish in nearly 32,000 acres of the Canadian River and its tributaries. The DEIS fails to specifically address or mention livestock grazing and its environmental impacts which contributed to the river's current state. Also, the DEIS fails to consider the environmental impacts of hydrologic impoundments and provide any conclusions as to their impacts to the systems' existing conditions. The DEIS does not provide any discussion about environmental impacts which occur from the absence of beaver, a keystone riparian species, within the project area and their role in sustaining hydrological function in the riparian system.

As well, the DEIS does not address environmental impacts associated with ORV travel, yet indicates that motorized use in the canyon includes ATV and motorcycle riding.

Response – Tamarisk is an invasive phreatophyte occupying riparian areas throughout the western United States and is not unique to the Canadian River. In New Mexico, tamarisk is a dominant plant along the Rio Grande and Pecos and Canadian Rivers along with many smaller stream systems and tributaries of larger river systems. Tamarisk is an aggressive competitor often growing in monoculture stands and is suspected of lowering water tables and changing the hydrologic function of river systems and destroying or severely degrading wetlands and wildlife habitats. Interspecies competition and shading by dense tamarisk stands results in reduced biodiversity. Tamarisk communities along rivers generally have fewer indigenous plants compared to native plant communities where plant density and ground cover are greater. Tamarisk is able to exploit suitable sites over a longer period than native plants because of its season-long seed production.

Permitted livestock grazing within the Canadian River Canyon on the Kiowa National Grassland is authorized per the terms and conditions of three term grazing permits. Livestock grazing on K-135 (approximately 2.5 miles of river corridor) is grazed under on-off provisions along with state and private lands. Between 9 and 15 head of cattle are authorized for use within this portion of the river pasture for no more than 4 months during the fall and winter months only. Livestock use in this pasture has occurred once in the last 5 years. Livestock grazing on K-91 (approximately 9 miles of river corridor) is no longer permitted, and has not been authorized for livestock grazing

since 2003. Livestock grazing on K-87 (approximately 1 mile of river corridor) river pasture is permitted for 1 month only during the dormant season and has been grazed twice in the last 9 years. Livestock grazing on K-136 (approximately 5.5 miles of river corridor) is grazed under on-off provisions along with state and private lands. Between 30 and 80 head of cattle are authorized within the river pasture for a total of 4 months during the winter and spring months only. Authorized livestock grazing does not occur during the growing season for any Forest Service administered portion of the Canadian River corridor, and the remaining grazing activities occur on a limited, planned basis per AMPs and annual operating instructions. The stream health assessment for the Canadian River through the Kiowa National Grassland completed in 2004 did not indicate livestock grazing as a causative factor contributing to current condition ratings.

This riparian stream health assessment for the Forest Service administered reach of the Canadian River indicated that the Canadian River system within the Kiowa National Grasslands is in an *Impaired* condition as a result of sediment infilling between substrates. The high sediment load coming into the upper end of the system on the Kiowa National Grassland is primarily due to the result of current and past land use practices within the upper contributing watershed. The watershed is listed as impaired by the State of New Mexico (www.epa.gov). The historic daily mean for water discharge in this river system within the reach that includes the Kiowa National Grassland administered portion of the river ranges from 50 to 1,022 cubic feet per second. The flashy, high water nature of the stream system is conducive to extensive bedload movement. The lack of large, woody debris in the system to capture and store sediment also reduces the overall carrying capacity of the stream system, resulting in the condition rating.

The desired condition for the stream system on the Kiowa National Grassland is of course a *Robust* rating. However, with the flashy nature of the river flows, erosive soils, and upstream management activities persisting, the instability of this system will continue in the near future. In general, the change of species composition from a tamarisk-dominated riparian area, to a cottonwood, willow, and grass-dominated riparian area, will increase the riverine diversity screen rating toward Robust. The high input of sediment as a result of the erosive nature of the geology of the area will continue; however, the number of nick points to trap and store sediment may increase with the increase of native woody vegetation and large woody debris into the system over time, enabling increased stabilization throughout the stream system.

There are no hydrologic impoundments which affect water flow of the Canadian River within the administrative boundaries or upstream of Forest Service administered lands. Impoundments or dams on the Canadian River are located a significant distance downstream at Conchas Lake and Ute Lake.

Activities associated with OHV travel are addressed in the DEIS within the "Soils and Watershed" section beginning on page 36 and the "Heritage" section beginning on page 76. The district is currently in the preliminary stages of travel management planning with a scheduled decision date of 2008. Off-highway vehicle travel and OHV activity within the Canadian River riparian corridor on the Kiowa National Grassland will be addressed within that analysis process.

Comment – The DEIS additionally failed to justify how tamarisk removal will allow for native vegetation, such as cottonwoods and willows, to naturally recruit to treated areas. Simply treating the symptom of the underlying problem will not resolve the reason why tamarisk thrives in this riparian system.

Response – It is unclear what the phrase "...failed to justify how tamarisk removal will allow for native vegetation such as cottonwoods and willows, to naturally recruit to treated areas" means. We recognize that the DEIS does not provide significant detail on the re-establishment of native vegetation. This has been clarified in the FEIS description of the proposed action's restoration activities and in the "Vegetation Effects" section of chapter 3.

Comment – Further, the DEIS fails to disclose that the proposed area lies within a roadless area and is presently a candidate for "Wild and Scenic River" designation. The Forest Service needs to insure that all applicable Federal environmental safeguards for these special areas are enforced.

Response – This information was included in the recreation/scenery specialist report for the project. Although the DEIS included brief disclosures of the effects on roadless characteristics and "Wild and Scenic River" potential, it did not include a description of these in the "Affected Environment" section. For clarification, a brief discussion has been included in the FEIS.

Comment – The DEIS fails to address the cumulative effects of a number of current management or proposed actions. For instance, the DEIS does not address the cumulative effects of livestock grazing, which occurs in the majority of proposed project areas. In fact, the DEIS does not address livestock grazing at all, including how it will impact the proposed action. The DEIS further fails to address how livestock grazing will effect natural recruitment of native vegetation in treated areas.

Response – See the responses to previous comments above.

Authorized livestock grazing does not occur during the growing season for any Forest Service administered portion of the Canadian River corridor, and the remaining grazing activities occur on a limited, planned basis per AMPs and annual operating instructions. Management of livestock grazing activities within the riparian area is already correlated with riparian concerns to protect and restore wetland vegetation. Recruitment of native vegetation within treated areas will be an additional consideration during scheduled use of the river pastures. Also refer to the DEIS, "Chapter 3. Affected Environment and Environmental Consequences," "Vegetation," pages 17-19.

Comment – The DEIS does not address that cumulative effects of retreating areas up to 5 years with herbicide (leaving undisturbed up to 7 years) and the cumulative effects of revegetation and natural recruitment. The DEIS does not discuss the cumulative effects of genetically distinct native vegetation, which had adapted to this particular environment, and that will be killed off through aerial herbicide application. The DEIS does not address weed suppression in areas which have been treated.

Response – Aerial foliar application of herbicide is proposed for use in one application. There are no additional aerial spray applications proposed under this action. The proposal includes re-treatment by hand application of re-sprouts for up to 5 years following the initial treatment. Standing dead trees need to be left for a minimum of 2 growing seasons prior to any removal activity in order for the chemical to be fully effective following treatment. These parameters do not equate to retreating entire areas for up to 5 years and leaving areas undisturbed for up to 7

years. Natural recruitment of native vegetation will begin the next growing season following initial treatment and continue throughout the life of the project.

Replanting treated areas as needed with native riparian species is part of the proposed action, DEIS, "Chapter 2. Alternatives Including the Proposed Action," page 8. Restoration of the portion of the Canadian River which flows through the Kiowa National Grassland is currently planned and in progress in conjunction with the Natural Resources Conservation Service's Native Plant Material Center in Los Lunas, New Mexico. The forest has been collecting native plant seeds and cuttings from individual sources currently growing within the canyon corridor on the national grasslands since 2005. This riparian plant material, including trees, shrubs, rushes and cattails, are being propagated at the farm in Los Lunas. Following salt cedar treatment activities, when the site is ready for rehabilitation and restoration activities, the Plant Materials Center will make these seedlings available for transplanting back within the natural system from which they were originally collected.

Additionally refer to the DEIS, "Chapter 3. Affected Environment and Environmental Consequences, Vegetation," pages 17-19. Some intermixed stands are not accessible by road or trail and cannot be hand treated to remove only the salt cedar. Therefore, some intermixed stands of cottonwood, willow and tamarisk will be killed. However, most infestations that occur in mixed stands with native species would not be aerially sprayed. All of the estimated 160 acres of mixed stands that are accessible by road or trail would be treated with stem-specific applications. There would be little or no direct effect on adjacent native vegetation. The untreated native vegetation would provide a seed source for a more rapid recovery and colonization of native vegetation into treated areas.

It is not anticipated that the riparian area (as a result of salt cedar treatment activities) would experience a new infestation of any nonnative or invasive weed that was not previously located in the area. Weeds must also be established from a localized or transported seed source, just like native vegetation. Therefore, if these weeds do not currently exist in the canyon to provide a seed source for a current infestation, then there is limited likelihood that a new seed source for a new invasive weed will become available immediately following treatment.

Comment – The DEIS indicates that bank and soil stabilization is a reason why mechanical extraction was not further considered. Herbicide treated tamarisk will lose its root structure integrity within 1 to 2 years after initial treatment, and the DEIS does not address this cumulative effect in the proposed project area, and additionally, does not address the current sinuosity and channelization or whether bank destabilization will have long-term positive or negative effects.

Response – Bank stability is listed as one of the secondary reasons for not considering mechanical extraction as an alternative. Upon removal of the root structure through mechanical extraction, the area immediately becomes less stable. Otherwise killing the plant (such as proposed through herbicide use) and leaving the roots in place provides for stabilization until the roots begin to decompose. Because tamarisk has been shown to channelize and deepen a stream there are expected benefits of removing the plant - increasing sinuosity and the width-to-depth ratio. Additional analysis of the effect of the project alternatives on bank stability and effects on channel geomorphology are included in the "Soil and Water" section of chapter 3.

Comment – The DEIS violates the NEPA prohibition against predetermined results because the USFS inappropriately framed the project purpose so as to ensure that herbicide treatment would be authorized. Specifically, rather than framing the issue for environmental review as one of whether herbicide treatment should be authorized, the EIS states that "[t]he purpose of the proposed action is to…treat tamarisk…" Because adjacent landowners necessite this action be authorized, an unbiased conclusion could not possibly be reached. Simply put, by framing the project purpose in such a skewed fashion, the USFS preempted the possibly of accepting a no herbicide determination. This is exactly the kind of predetermined result NEPA prohibits.

Response – The FS appropriately determined the purpose and need: to eradicate salt cedar to help improve the hydrologic function of the Canadian River and promote re-establishment of native vegetation. The ID team and responsible official considered non-herbicide alternatives. Because they were not feasible given the physical setting and management limitation associated with activities with the Canadian River Canyon, they were not analyzed in detail, as provided by the CEQ NEPA regulations.

Comment – NEPA § 102(2)(B) requires Federal agencies to develop methods to ensure that unquantified environmental amenities and values will be taken into account in decisionmaking… The proposed action does not address the overall cost and management that is needed to adequately control tamarisk in the proposed project area. The DEIS does not address adequately or budget for revegetation of native riparian vegetation, removing biomass of dead tamarisk and other non-intended species. Removal of dead skeleton tamarisk trees is important after mechanical root crown removal, bio-control, or aerial herbicide control has been successful. Mechanical mulching, by its nature, accomplishes the dead material management by transforming it into mulch. Dead trees in either moderately or highly infested areas need removal because of the potential for wildfires that could damage valuable native vegetation. Removal is also important to help in the revegetation effort. The DEIS indicates that mechanical removal is not cost efficient. However, according to a 2006 report published by the Tamarisk Coalition entitled "Cost Component from Non-Native Phreatophyte Control," mechanical and aerial sprayed are comparable.

Response – The EIS addresses the non-quantifiable amenities and values such as wildlife habitat, scenery, and effects on native vegetation. If we were able to place a value on loss of biodiversity, water, ecosystem integrity, and aesthetics, not treating salt cedar would probably result in amenity losses several times higher than projected eradication and rehabilitation costs. Given the information in the EIS, the responsible official can give these amenities their "appropriate consideration in decisionmaking" as required in Section 102(2)(B) of the National Environmental Policy Act.

Utilizing cost estimates from 2006 application activities in adjacent areas, aerial application of the herbicide imazapyr (common trade names Arsenal® and Habitat®) according to label directions and as described in the proposed action would cost an estimated $167 per acre. The combination of mechanical and herbicide treatment would cost an estimated $300 per acre. The total initial treatment cost would be an estimated $111,500.

Mechanical extraction treatment in comparable areas to the limited portions of the Canadian River through the Kiowa National Grassland that is accessible by mechanical equipment is $500 to $3,000 per acre. These cost estimates are for a method that utilizes a backhoe equipped with

mechanical thumb to grasp the invasive tree and pull it up, roots and all. Mechanical treatments such as described in the proposed action encompass actions such as "shredder with stump spray treatment and/or shears with stump spray treatments." The costs of mechanical treatments, as described, are very site-specific and depend on a number of factors. They include the remoteness of the project area, terrain features, soil and substrate types, road access, density of infestation, the size and age of salt cedar stands, the density of native vegetation mixed with the salt cedar stand, the type and size of equipment needed/utilized, and the mitigating measures necessary to protect riverbanks and wetted areas. These variables account for the wide range of cost estimates for mechanical treatments. The cost of hand treatments such as the use of chain saws followed by stump spray treatments ranges from $1,500 to $5,000 per acre, again depending on tree size, infestation density, etc. All cost figures presented are from estimates derived from the Tamarisk Coalition publications and as per actual project work on other areas in and around the Canadian River in northeastern New Mexico.

Work is currently underway with the Canadian River Riparian Restoration Project to develop site descriptions and to determine the most effective rehabilitation approach for different sites. All rehabilitation efforts will be monitored for their effectiveness to help make choices for future sites. Rehabilitation of treated areas will include removing hazard trees around developed recreation facilities and other accessible areas of the canyon as needed. Rehabilitation efforts may also include chipping, burning, reseeding and planting. Planting/seeding is generally estimated to cost $45 to $100 per acre, depending on the density of plants and seed application methodology used. Burning is estimated at a cost of $160 per acre, depending on the complexity of the burn area. Cost of mechanical clearing of tree skeletons varies with the terrain and density of material, but will generally average $400 to $500 per acre. Considerations must also be given to leaving dead skeleton material onsite to decay naturally into the system. Observations have shown that dead standing material also has the potential to provide interim habitat for a variety of wildlife species.

Seed stock from the Canadian River is currently being grown to supply native plants for replanting efforts at the Native Plant Material Center. Funding for collection and propagation of the seed stock material has been provided through cooperative grant sources. See response to comments above for additional information on the seed stock program.

Comment – Overall, Forest Guardians strongly urges a comprehensive plan be developed—one that eradicates nonnative invasive riparian vegetation populations, but at the same time promotes the growth of native riparian species and addresses land management decisions, which have severely impacted the ecological functionality of the riparian systems in New Mexico. Addressing all of these factors is the only way to sustain restoration and to control the nonnative species within these ecosystems. This is the only alternative which responsible land managers should address current problems. We, therefore, respectfully request that the USFS reconsider and revise its DEIS to include all activities which will provide an environment for success.

Response – The Canadian River Riparian Restoration Project is an assembly of all parties with interest in the Canadian River Riparian Restoration Project, including the Forest Service under a participating agreement. The project encourages cooperation, education and discourse for the betterment of the Canadian River watershed through the scope of the Riparian Restoration Project and serves as the advising body.

The Forest Service and State of New Mexico both have responsibility for controlling undesirable plants on lands under their jurisdiction. Since tamarisk originates from both private and public lands, and since infestations often occur on adjacent jurisdictions, it is in the interest of both parties to work together in a cost-effective manner to locate and treat infestations, prevent its' spread, and monitor treatment activities.

The overall river project on the Canadian River is guided by a steering committee which is made up of eight Soil & Water Conservation Districts located on the Canadian River watershed and the New Mexico Association of Conservation Districts. Technical advice and expertise for the project is provided by a variety of State and Federal agencies along with private groups such as the Forest Service, Wild Turkey Federation, New Mexico State University County Extension Service, Natural Resources Conservation Service, Resource Conservation & Development Councils, New Mexico State University Range Improvement Task Force, United States Geological Survey, New Mexico State Land Office, and Canadian River Municipal Water Authority.

To implement the various control, monitoring, and rehabilitation objectives of the Canadian River Project, the Forest Service developed the proposed action in collaboration with the Canadian River Project group and in conjunction with the larger project, which encompasses the entire river system within New Mexico. The "New Mexico State Wide Policy and Strategic Plan for Non-Native Phreatophyte/Watershed Management" comprehensive plan, along with other related documents produced by the Tamarisk Coalition such as "New Mexico Options for Non-native Phreatophyte Control" were utilized extensively in this process. The proposed action (DEIS pg. 7-9) encompasses the use of various methods of herbicide application, mechanical treatments, hand treatments, rehabilitation efforts along with mitigation measures and monitoring to address project objectives, recognizing that a variety of treatments and rehabilitation options are necessary to meet the purpose and need for project action.

Department of Interior

Comment – DOI offered the following general comment for consideration in development of the FEIS: Historic riparian willow-cottonwood community assemblages in the southwestern United States were primary habitat for the native southwestern willow flycatcher (*Empidonax traillii extimus*) and the yellow-billed cuckoo (*Coccyzus americanus*) (Howe, 1986; USFWS, 2002). Howe (1986) indicates that limited sightings of the yellow-billed cuckoo were observed throughout New Mexico, including along the Canadian River, since the 1950s. The U.S. Geological Survey offers research results which might help in efforts to restore adequate plant canopy stratification and protection for recovery of these imperiled bird species (Allison et al., 2000, Shaforth et al., 2005, Skagen et al., 2005, Sogge et al., 2003, and Wiggens, 2005).

Response – The Forest Service has addressed both the southwestern willow flycatcher and the yellow-billed cuckoo in the DEIS. Although historic riparian willow and cottonwood community assemblages in the southwestern United States may have been primary habitat for the native southwestern willow flycatcher, the USFWS has delineated the current range of *Empidonax trailli extimus* as being west of the Canadian River and proposed treatment area (USFWS, 2002; SWWF Recovery Plan; Fig. 11 Rio Grande Recovery Unit).

As discussed in the DEIS, we recognize that in New Mexico, the yellow-billed cuckoos are known to nest in riparian areas, preferably cottonwood galleries with an established willow understory. It is important to note that during our Mills Canyon breeding bird surveys conducted

since the early 1990s, we have not detected any yellow-billed cuckoos nesting within the Canadian River drainage. The Forest Service is interested in potential impacts to nesting yellow-billed cuckoos with implementation of the proposed action and its associated activities. Although your reference of Howe (1986) indicates that limited sightings of the yellow-billed cuckoos were observed throughout New Mexico, including along the Canadian River, since the 1950s, we do not know which stretch of the Canadian River drainage Howe is referring to. Nor do we feel that migrating yellow-billed cuckoos will be impacted by implementation of the proposed action, because a well distributed gallery of mature cottonwoods and willows will remain as travel corridors after treatment.

U.S. Environmental Protection Agency

Comment – The EPA reviewed the DEIS in accordance with their responsibilities under Section 390 of the Clean Air Act, NPA, and the CEQ regulations implementing NEPA. EPA classified the DEIS and proposed action as "LO" – EPA has "Lack of Objections" and noted that their classification will be published in the Federal Register.

Response – No response needed. The EPA classification of LO was published in the Federal Register on February 23, 2007.

February 9, 2007

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VIA EMAIL & FAX

Re: Comments on Draft Environmental Impact Statement for Canadian River Tamarisk Control

Dear Mr. Baker,

These comments are submitted on behalf of Forest Guardians, Wild Watershed, New Mexico Wilderness Alliance, and the Multiple Chemical Sensitivities Task Force of New Mexico and our more than 6,000 members who care deeply about the health of our waterways, the diversity of life, the wildlands protection. We believe there is an inextricable link between economic and ecosystem health and those activities that harm our environment undermine our overall well-being. The Cibola National Forest proposes under its preferred alternative to aerial spray Imazapyr over approximately 380 acres, and backpack spray Imazapyr over approximately 160 acres, to control tamarisk along a 16-mile portion of the Canadian River in the area just north of Biscante Canyon to just south of Whitman Canyon.

Overall, Forest Guardians firmly believes this Draft Environmental Impact Statement (DEIS) is inadequate, and violates the National Environmental Policy Act on several basic levels. In response to the DEIS, we strongly recommend that an additional alternative of mechanical removal be reconsidered in detail, and not cursorily dismissed, as is the case in this analysis. In particular, we oppose aerial herbicide treatment along a riparian corridor and likewise believe that the DEIS fails to consider the other factors which have led to this infestation of tamarisk. This DEIS is, for the reasons discussed below, sufficiently inadequate that it precludes meaningful disclosure and analysis of impacts. We request that it be revised and recirculated as a draft in accordance with 40 CFR § 1502.9 (a).

Purpose and Need

The Forest Service asserts in its DEIS that the project's purpose and need is twofold: first, to restore the hydrologic function for the Canadian River and second, to treat tamarisk before it can re-seed upstream and downstreams areas which have been or soon will be treated. However, the proposed action does not adequately respond to or address

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the ecological processes and ecological agents necessary to restore hydrologic function and thus is not responsive to the Forest Service's articulated purpose and need. We believe that analyzing both changes in the hydrograph and removal of keystone species like beaver must be done in order to develop an approach which will restore the ecological health of the Canadian River and its riparian ecosystems. Treating one symptom (killing the tamarisk) of the current dysfunctional ecological condition in the project area, while not addressing the conditions that allow tamarisk to dominate in its current condition, is naïve and misleading at best and will result in the project's failure. For these reasons we believe that the DEIS is fatally flawed and inadequate under the National Environmental Policy Act (NEPA), 42 U.S.C §§ 4321 *et seq.*, and its implementing regulations.

NEPA

NEPA is an integral tool for insuring that agency decision-making is thoughtful, unbiased, and executed in the best interests of the public at large. Before the USFS may undertake any "major federal action,"[1] it must first determine whether that action will have significant impacts on the environment.[2] As here, that determination is typically made through the development of an Environmental Impact Statement (EIS). Although NEPA has been characterized as "primarily procedural," courts have held that "agency action taken without observance of the procedure required by law will be set aside."[3]

Inadequate Range of Alternatives

NEPA requires federal agencies to consider alternatives to their proposed actions, and examine the environmental impacts of those alternatives. This requirement implements NEPA's environmental policies. It requires federal agencies to consider whether they can carry out their proposed action in a less environmentally damaging manner, and whether alternatives exist that make the action unnecessary. In fact, the Council on Environmental Quality (CEQ) has described the alternatives requirement as the "heart" of environmental review.[4] The courts have been correspondingly emphatic, calling the alternatives requirement the "linchpin" of the EIS.[5] "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate."[6]

Here, the CEQ requires the USFS to present the realistic environmental impacts of its proposed action, as well as to present all reasonable alternatives to that action in comparative form.[7] A proper alternatives analysis should "rigorously explore" and "objectively evaluate" these alternatives, which means it should "devote substantial

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[1] Grazing management decisions constitute "major federal actions" for the purposes of NEPA. *See NRDC v. Morton*, 388 F.Supp. 829 (D.D.C. 1974).
[2] *See* 42 U.S.C. § 4332(2)(C).
[3] *Save the Yaak Comm. v. Block*, 840 F.2d 714, 717 (9th Cir.1988).
[4] *See* 40 C.F.R. § 1502.14
[5] *See Monroe County Conservation Council, Inc. v. Volpe*, 472 F.2d 693 (2nd Cir.1972).
[6] *Alaska Wilderness Recreation & Tourism v. Morrison*, 67 F.3d 723, 729 (9th Cir.1995).
[7] *See* 40 C.F.R. § 1502.14.

treatment to each alternative considered in detail- including the proposed action- so that reviewers may evaluate their comparative merits."[8]

The USFS failed to meet NEPA's alternatives requirement in the DEIS because it erroneously chose a narrow scope of alternatives, which did not offer *substantial ecological variation*. A proper variety of alternatives should explore more than just no action and the proposed action, which is all the DEIS does. The Forest Service should issue a revised DEIS which includes an actual restoration alternative of the proposed project, such as active restoration of native vegetation and remedies to the threats from hydrologic impoundment and livestock grazing. Simply put, the alternatives analysis in the DEIS must go beyond a mere analysis of using herbicide to treat the results of these current and historic management practices. The USFS is obligated by NEPA to examine action alternatives that differ from one another in ecological impact, *i.e.*, action alternatives that will carry out the project purpose in a "less environmentally damaging manner" than the proposed action.

In the Proposed Action, "environmental impacts" include damage to vegetation, soil and water, wildlife, habitat, and air and water quality. The alternative analysis for any decision, therefore, should encompass action alternatives that impact these resources at differing levels. This means the USFS must consider action alternatives with varying treatment methods and resource-specific mitigation measures.

The range of alternatives to be set forth in an EIS is governed by the "rule of reason."[9] Certainly, the USFS need not consider an infinite range of alternatives to its proposed action. However, the agency must meaningfully consider reasonable and feasible alternatives grounded in the need for resource conservation in and around the action area. We feel that "non-herbicide alternatives" falls well within the rule of reason.

Because of this specific failure in the alternatives analysis of the DEIS, the USFS has not met NEPA's requirement for an adequate range of alternatives.

No "Hard Look"

NEPA sets forth a "national policy which will encourage productive and enjoyable harmony between man and his environment…[and] promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare

[8] 40 C.F.R. § 1502.14(b); *see also* Council on Environmental Quality, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 Fed. Reg. 18026, 18027, 18028 (1981): Question 5 (degree of analysis devoted to each alternative to be substantially similar to degree of analysis devoted to proposed action); Question 7 (comparing discussion of alternatives with discussion of environmental consequences and suggesting that discussion of alternatives be presented concisely in comparative form, including charts and tables); *see also* 40 C.F.R. § 1502.2(d) (impact statement must state how alternatives achieve goals of statute); 40 C.F.R. § 1505.1(e) (alternatives considered by decision maker must encompass those included in impact statement); 40 C.F.R. § 1503.2(b) (alternatives to include no-action alternative, other reasonable courses of action and mitigation measures).

[9] *See* 40 C.F.R. § 1502.13.

of man."[10] Thus, NEPA establishes "action-forcing" procedures that require agencies to take a "hard look" at environmental consequences."[11]

"[T]he comprehensive 'hard look' mandated by Congress and required by the statute must be timely, and it must be taken objectively and in good faith, not as an exercise in form over substance, and not as a subterfuge designed to rationalize a decision already made…'The unequivocal intent of NEPA is to require agencies to consider and give effect to the environmental goals set forth in the Act, not just to file detailed impact studies which will fill governmental archives.'"[12]

Any EIS must provide enough evidence and analysis of environmental impacts for the USFS to make an informed decision, and for the public to comment accordingly.[13] The information presented in an EIS must be of "high quality," and include "accurate scientific analysis."[14] The statement of reasons is crucial to determining whether the agency took a "hard look" at the potential environmental impacts of the project.[15] The herbicide proposed for use is highly toxic and may pose risks to human and environmental health According to the Journal of Pesticide Reform Factsheet: "Imazapyr is corrosive to eyes and can cause irreversible damage. Imazapyr containing herbicides are irritating to both eyes and skin". The journal further states that "Adverse effects found in laboratory animals after chronic exposure to Imazapyr include the following: fluid accumulation in the lungs of female mice, kidney cysts in male mice, abnormal blood formation in the spleen of female rats, an increase in the number of brain and thyroid cancers in male rats, and an increase in the number of tumors and cancers of the adrenal gland in female rats". The factsheet indicates that Imazapyr can persist in soil for over a year, and that persistence studies suggest that imazapyr residues damage plants at concentration that are not detectable by laboratory analysis. The factsheet also indicates that Imazapyr moves readily in soil and has contaminated surface and ground water following aerial and ground forestry applications. The DEIS inadequately discusses these impacts.

The DEIS failed to disclose and analyze the conditions that have allowed tamarisk to flourish in nearly 32,000 acres of the Canadian River and its tributaries. The DEIS fails to specifically address or mention livestock grazing and its environmental impacts which contributed to the river's current state. Also, the DEIS fails to consider the environmental impacts of hydrologic impoundments and provide any conclusions as to their impacts to the systems' existing conditions. The DEIS does not provide any discussion about environmental impacts which occur from the absence of beaver, a

[10] 42 U.S.C. § 4321.
[11] *See Methow Valley*, *supra* note 13, at 348.
[12] *Metcalf*, *supra* note 12, at 1142, *quoting Environmental Defense Fund v. Corps of Eng'rs of the U.S. Army*, 470 F.2d 289 (8th Cir.1972).
[13] 40 C.F.R. § 1508.9(b).
[14] 40 C.F.R. § 1500.1(b).
[15] *See id.*; *see also Marsh v. ONRC*, 490 U.S. 360, 374 (1989) (holding that NEPA requires that agencies "take a 'hard look' at the environmental effects of their planned action, even after a proposal has received initial approval").

keystone riparian species, within the project area and their role in sustaining hydrological function in the riparian system.
As well, the DEIS does not address environmental impacts associated with ORV travel, yet indicates that motorized in the canyon includes ATV and motorcycle riding.

The DEIS additionally failed to justify how tamarisk removal will allow for native vegetation, such as cottonwoods and willows, to naturally recruit to treated areas. Simply treating the symptom of the underlying problem will not resolve the reason why tamarisk thrives in this riparian system.

Further, the DEIS fails to disclose that the proposed area lies within a roadless area and is presently a candidate for "Wild and Scenic River" designation. The Forest Service needs to insure that all applicable federal environmental safeguards for these special areas are enforced.

Inadequate Cumulative Impacts Analysis

"Cumulative impact" is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[16]

The CEQ interprets NEPA and its corresponding regulations to require an analysis and a concise description of the identifiable present effects of past actions. The USFS must do this to the extent that past actions are relevant and useful in analyzing whether the reasonably foreseeable effects of the current proposal may have a continuing, additive and significant relationship to past impacts.[17] The courts of appeal have adopted different tests to determine what cumulative impacts of actions must be included in a discussion of environmental impacts. The Ninth Circuit, for example, applied the CEQ regulation that all "reasonably foreseeable" actions that have potential cumulative impacts must be addressed in an EIS or EA.[18]

The DEIS fails to address the cumulative effects of a number of current management or proposed actions. For instance, the DEIS does not address the cumulative effects of livestock grazing, which occurs in the majority of proposed project area. In fact, the DEIS does not address livestock grazing at all, including how it will impact the proposed

[16] 40 C.F.R. § 1508.7; *see also Inland Empire Pub. Lands Council* v. *United States Forest Serv.*, 88 F.3d 754 (9th Cir. 1996); and Coalition on Sensible Transp., Inc. v. Dole, 826 F.2d 60 (D.C. Cir. 1987).
[17] See 40 C.F.R. § 1502.22.
[18] *See e.g. Blue Mountains Biodiversity Project* v. *Blackwood*, 161 F.3d 1208 (9th Cir. 1998) (environmental assessment for timber sale must address cumulative effects of other "reasonably foreseeable" timber sales in the forest); *Kern* v. *United States Bureau of Land Mgmt.*, 284 F.3d 1062 (9th Cir. 2002) (timber sales); *Muckleshoot Indian Tribe* v. *United States Forest Serv.*, 177 F.3d 800 (9th Cir. 1999) (land exchange); *City of Tenakee Springs* v. *Clough*, 915 F.2d 1308 (9th Cir. 1990) (logging in forest); *Northern Alaska Envtl. Center* v. *Norton*, 351 F. Supp. 2d 1068 (D. Alaska 2005) (oil and gas leasing, must analyze effects of proposed plan amendment).

action. The DEIS further fails to address how livestock grazing will effect natural recruitment of native vegetation in treated areas.

The DEIS does not address that cumulative of effects of retreating areas up to 5 years with herbicide (leaving undisturbed up to 7 years) and the cumulative effects of revegetation and natural recruitment. The DEIS does not discuss the cumulative effects of genetically distinct native vegetation, which had adapted to this particular environment, and that will be killed off through aerial herbicide application. The DEIS does not address weed suppression in areas which have been treated.

The DEIS indicates that bank and soil stabilization is a reason why mechanical extraction was not further considered. Herbicide treated tamarisk will lose it root structure integrity within 1-2 years after initial treatment, and the DEIS does not address this cumulative effect in the proposed project area, and additionally, does not address the current sinuosity and channelization or whether bank destabilization will have long term positive or negative effects.

Predetermined Result

NEPA sets forth a "look before you leap" mandate, which prohibits predetermined results. This prohibition is essentially two-fold. First, the structure of the analysis and the framing of the issues within the EIS must allow for substantially varying outcomes. Second, the EIS must be developed before the outcome has been determined, and before an agency decision has been made.

Our interpretation of the predetermined results prohibition is supported by NEPA's implementing regulations and various court decisions. For instance, in connection with the preparation of an EIS, courts have observed that "[p]roper timing is one of NEPA's central themes. An assessment must be 'prepared early enough so that it can serve practically as an important contribution to the decision-making process and will not be used to rationalize or justify decisions already made.'"[19] Thus, NEPA's effectiveness depends entirely on involving environmental considerations in the initial decision-making process.[20]

As provided in the regulations promulgated to implement NEPA, "[a]gencies shall integrate the NEPA process with other planning *at the earliest possible time* to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts."[21] The phrase "early enough" means "at the earliest

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[19] *Metcalf v. Daley*, 214 F.3d 1135, 1142 (9th Cir.2000), *quoting Block*, at 718, which was referring to 40 C.F.R. § 1502.5.

[20] See 40 C.F.R. §§ 1501.2, 1502.5; *see also Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989) (explaining that NEPA "ensures that the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts").

[21] 40 C.F.R. § 1501.2 (emphasis added); *see also id.* § 1502.5 ("An agency shall commence preparation of an [EIS] as close as possible to the time the agency is developing or is presented with a proposal...").

possible time to insure that planning and decisions reflect environmental values."[22] In referring to NEPA's requirements as "action forcing," the Supreme Court has embraced the rule that for projects directly undertaken by federal agencies, EISs "shall be prepared at the feasibility analysis (go-no go) stage and may be supplemented at a later stage if necessary."[23]

The DEIS violates the NEPA prohibition against predetermined results because the USFS inappropriately framed the project purpose so as to ensure that herbicide treatment would be authorized. Specifically, rather than framing the issue for environmental review as one of *whether* herbicide treatment should be authorized, the EIS states that "[t]he purpose of the proposed action is to...treat tamarisk..." Because adjacent landowners necessite this action be authorized, an unbiased conclusion could not possibly be reached. Simply put, by framing the project purpose in such a skewed fashion, the USFS preempted the possibly of accepting a no herbicide determination. This is exactly the kind of predetermined result NEPA prohibits.

Inadequate Cost-Benefit Analysis

NEPA § 102(2)(B) requires federal agencies to develop methods to ensure that unquantified environmental amenities and values will be taken into account in decision-making. Courts, too, have noted that environmental and economic considerations may often conflict, and that their consideration requires a balancing process.[24]

Such a conflict between environmental and economic considerations exists on the management action at issue. The proposed action does not address the overall cost and management that is needed to adequately control tamarisk in the proposed project area. The DEIS does not address adequately or budget for revegetation of native riparian vegetation, removing biomass of dead tamarisk and other non-intended species. Removal of dead skeleton tamarisk trees is important after mechanical root crown removal, bio-control, or aerial herbicide control has been successful. Mechanical mulching, by its nature, accomplishes the dead material management by transforming it into mulch. Dead trees in either moderately or highly infested areas need removal because of the potential for wildfires that could damage valuable native vegetation. Removal is also important to help in the revegetation effort. The DEIS indicates that mechanical removal is not cost efficient. However, according to a 2006 report published by the Tamarisk Coalition entitled "Cost Component from Non-Native Phreatophyte Control," mechanical and aerial spayed are comparable.

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[22] *Andrus v. Sierra Club*, 442 U.S. 347, 351 (1979); *see also* 40 C.F.R. § 1501.2 (1999).
[23] *Id.*, at 351 n. 3; *see also* 40 C.F.R. § 1502.5(a).
[24] *See Sierra Club v. Sigler*, 695 F.2d 957 (1983) (holding that NEPA mandates at least a broad, informal cost-benefit analysis by federal agencies of economic, technical and environmental costs and benefits of particular action); *see also Calvert Cliffs' Coordinating Comm. Inc. v. Atomic Energy Comm'n*, 449 F.2d 1109, 1113 (D.C. Cir. 1971).

Conclusion

Overall, Forest Guardians strongly urges a comprehensive plan be developed--one that eradicates non-native invasive riparian vegetation populations, but at the same time promotes the growth of native riparian species and addresses land management decisions, which have severely impacted the ecological functionality of the riparian systems in New Mexico. Addressing all of these factors is the only way to sustain restoration and to control the non-native species within these ecosystems. This is the only alternative which responsible land managers should address current problems. We, therefore, respectfully request that the USFS reconsider and revise its DEIS to include all activities which will provide an environment for success.

Respectfully Submitted,

Jim Matison
Restoration Director
Forest Guardians
On behalf of:

Sam Hitt, Executive Director
Wild Watershed

Michael Scialdone, Wilderness Protection Director
New Mexico Wilderness Alliance

Ann McCampbell, MD
Chair, Multiple Chemical Sensitivities Task Force of NM

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United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
P.O. Box 26567 (MC-9)
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TAKE PRIDE IN AMERICA

ER 07/018
File 9043.1

February 9, 2007

Via electronic mail

Keith Baker
NEPA Coordinator
U.S. Forest Service
Cibola National Forest
2113 Osuna NE
Albuquerque, NM 87113

Subject: Review of Draft Environmental Impact Statement (DEIS) for Canadian River Tamarisk Control, Cibola National Forest, Harding and Mora Counties, New Mexico

Dear Mr. Baker:

The U.S. Department of the Interior has reviewed the subject DEIS and offers the following for your consideration as the final project documentation is developed.

GENERAL COMMENT

Historic riparian willow-cottonwood community assemblages in the southwestern United States were primary habitat for the native southwestern willow flycatcher (*Empidonax traillii extimus*) and the yellow-billed cuckoo (*Coccyzus americanus*) (Howe, 1986; USFWS, 2002). Howe (1986) indicates that limited sightings of the yellow-billed cuckoo were observed throughout New Mexico, including along the Canadian River, since the 1950s. The U.S. Geological Survey offers research results which might help in efforts to restore adequate plant canopy stratification and production for recovery of these imperiled bird species (Allison et al., 2000, Shafroth et al., 2005, Skagen et al., 2005, Sogge et al., 2003, Wiggens, 2005).

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U.S. Fish and Wildlife Service. 2002. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico. i-ix + 210 pp., Appendices A-O

Thank you for the opportunity to review and comment on this DEIS. If you have any questions concerning our comment, please contact Lloyd Woosley, Chief of the USGS Environmental Affairs Program, at (703) 648-5028 or at lwoosley@usgs.gov.

Sincerely,

Stephen R. Spencer
Regional Environmental Officer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

February 12, 2007

Nance Rose
Forest Supervisor
Cibola National Forest
2113 Osuna Road, NE
Albuquerque, NM 87113

Dear Ms. Rose:

In accordance with our responsibilities under Section 309 of the Clean Air Act, the National Environmental Policy Act (NEPA), and the Council on Environmental Quality Regulations (CEQ) for Implementing NEPA, the U.S. Environmental Protection Agency (EPA) Region 6 office in Dallas, Texas, has completed its review of the Draft Environmental Impact Statement (DEIS) for the Proposed Canadian River Tamarisk Control for Cibola National Forest Harding and Mora Counties, New Mexico.

EPA classified your DEIS and proposed action as "LO," i.e., EPA has "Lack of Objections". We ask that the FEIS provide additional information as discussed above. Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act, to inform the public of our views on proposed Federal actions.

We appreciate the opportunity to review the DEIS. We request that you send our office one (1) copy of the FEIS at the same time that it is sent to the Office of Federal Activities (2251A), EPA, 1200 Pennsylvania Avenue, N.W., Washington, D.C. 20044.

Sincerely yours,

Michael P. Jansky, P.E.
Regional EIS Coordinator

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